

**ARCHITECTURE DEPARTMENT**

**CHINESE UNIVERSITY OF HONG KONG**

MASTER OF ARCHITECTURE PROGRAMME

2009-2010

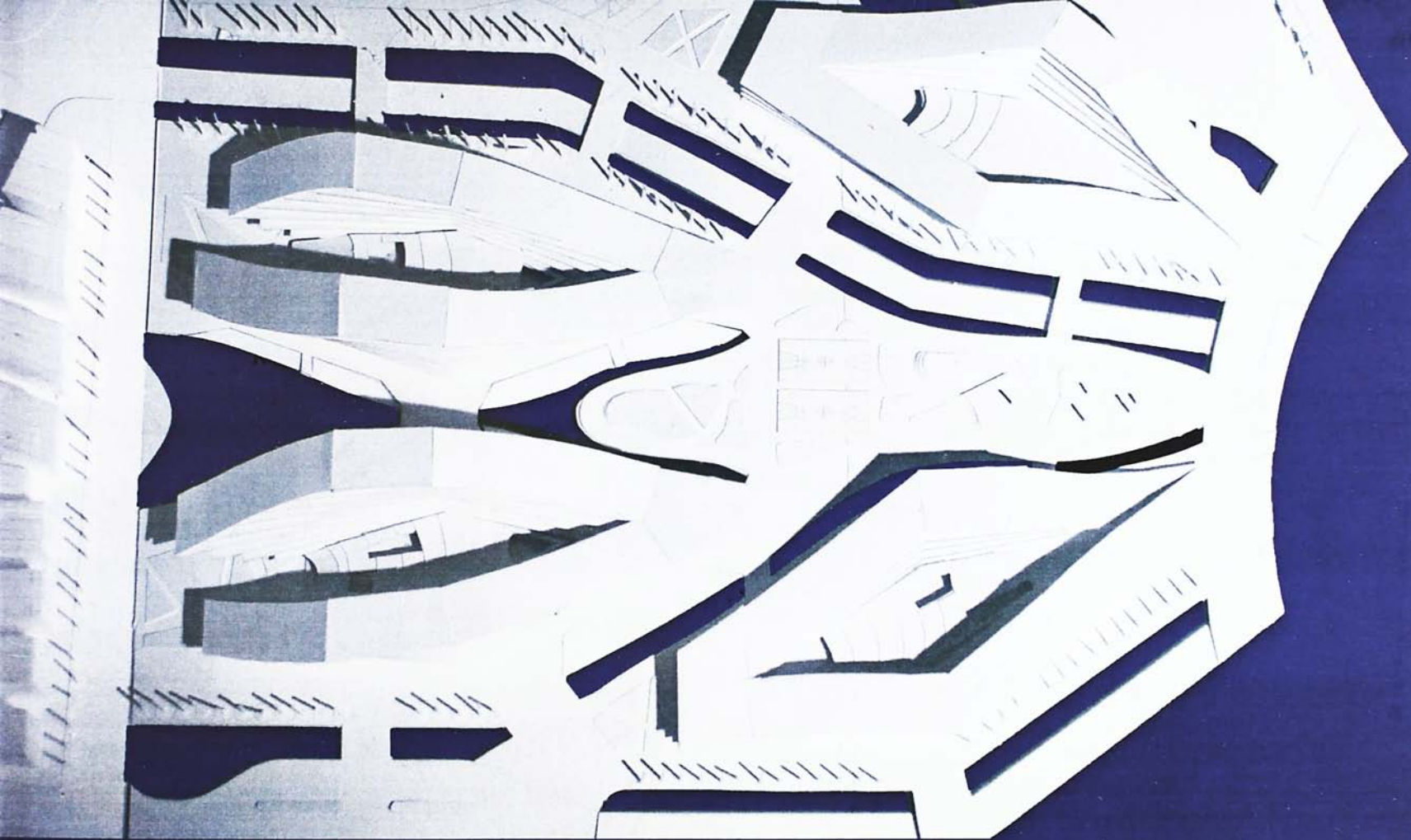
DESIGN REPORT

**PENETRATING OPEN FABRIC: KNITTING  
THE CITY URBANIZED WATERFRONT**

LAM Kwai Pui, Patrick

May 2010





# Penetrating open fabric

*knitting the city in urbanized waterfront*

Lam Kwai Pui Patrick 08041180 Advisor: TC yuet

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## 0.0 Abstract

To challenge the generic waterfront development nowadays which obstruct the inner city from the sea and creates a monotonous environment, this thesis rethinks the density- optimized housing development as a penetrating fabric that connects the inner city with waterfront.

By regulating the grid layout and urban structure, a new- diamond like circulation network of interwoven waterscape and landscape is resulted. This new network opens up the views and access to the waterfront, and provides an alternative environment as a buffer connection of the city. So as to minimize the harm of the view by cars, the carways are in between the pedestrianized waterways. Commercial programs are then distributed along the main streets while communal programs are on the sub walkways which are more private.

By exploring the relationship of building form and sunlight hours, the new housing fabric evolves to a system with fanned profile that provides adequate shading and lighting in summer and winter solstice. To give the residents the greatest possible pleasure from the location of the fabric, the twisted form creates terraces which provide all apartments deeper depth of views to the harbour front or waterscape. This thesis demonstrated a new fabric that responds to the specific context in urbanized waterfront, improving the environment visually, programmatically and climatically. At the same time, an additional living quality is provided for the residents.

# **[ Introduction ]**

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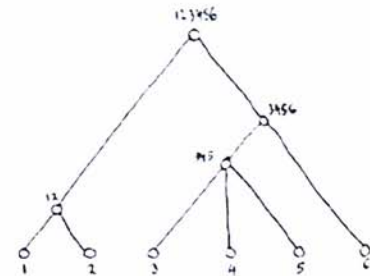
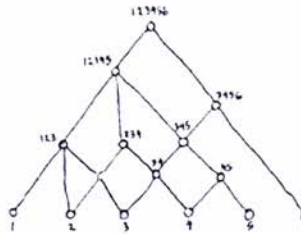
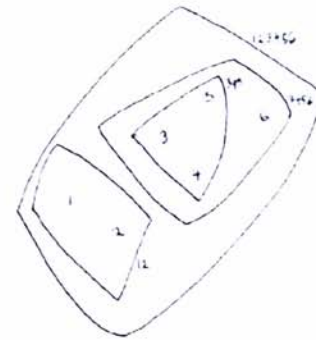
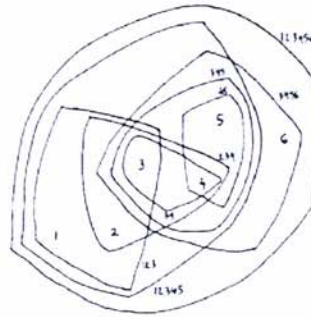
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# 1.1 Theory - “a city is not a tree”

Allow overlapping in the city

For the human mind, the tree is the easiest vehicle for complex thoughts. But the city is not, cannot and must not be a tree. The city is a receptacle for life. If the receptacle severs the overlap of the strands of life within it, because it is a tree, it will be like a bowl full of razor blades on edge, ready to cut up whatever is entrusted to it. In such a receptacle life will be cut to pieces. If we make cities which are trees, they will cut our life within to pieces.





# 1.2 Theory- Symbiosis

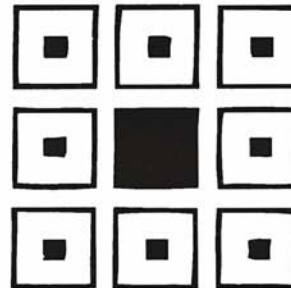
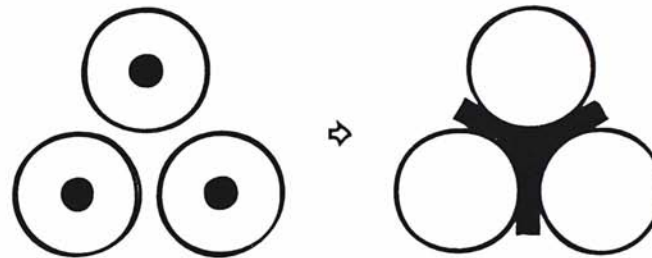
## Against Functionalism

Functionalism was applied most popularly in zoning theory. In Western society, architecture and city are in fundamental opposition to nature. Stout walls divide outside from inside, city ramparts clearly establish boundaries between the city and natural landscape.

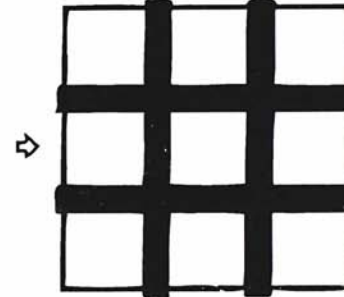
Modern architecture is characterized by the rejection of the commonplace and of anything redolent of the taste of the masses, as well as a separation from the surrounding society- exclusiveness.

It lacked intermediacy, the quality that enabled virtually inseparable, mutually co-existing elements of function to supplement each other. But because the lives of human beings are filled with unavoidable contradictions, it is only natural that architecture and cities should also contain contradictory elements.

We should now go back and pick up some of the things- intermediate zones and the allowance for vagueness- the functionalists cast away.



[1] Enclosed System



[2] Open System

## 1.3 Buffer zone in nature- Rock



Function: Maximize the opportunity towards natural resources



# 2.0 Issue

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Cebu: 776 8888



**the ultimate waterfront  
apartments of the highest**

Venue: 38 Sui  
 Ma Tau Street,  
 Kowloon  
 Date: 2007-03-31  
 Units: 1,782  
 Towers: 5  
 Levels: 51  
 Developer:  
 Henderson

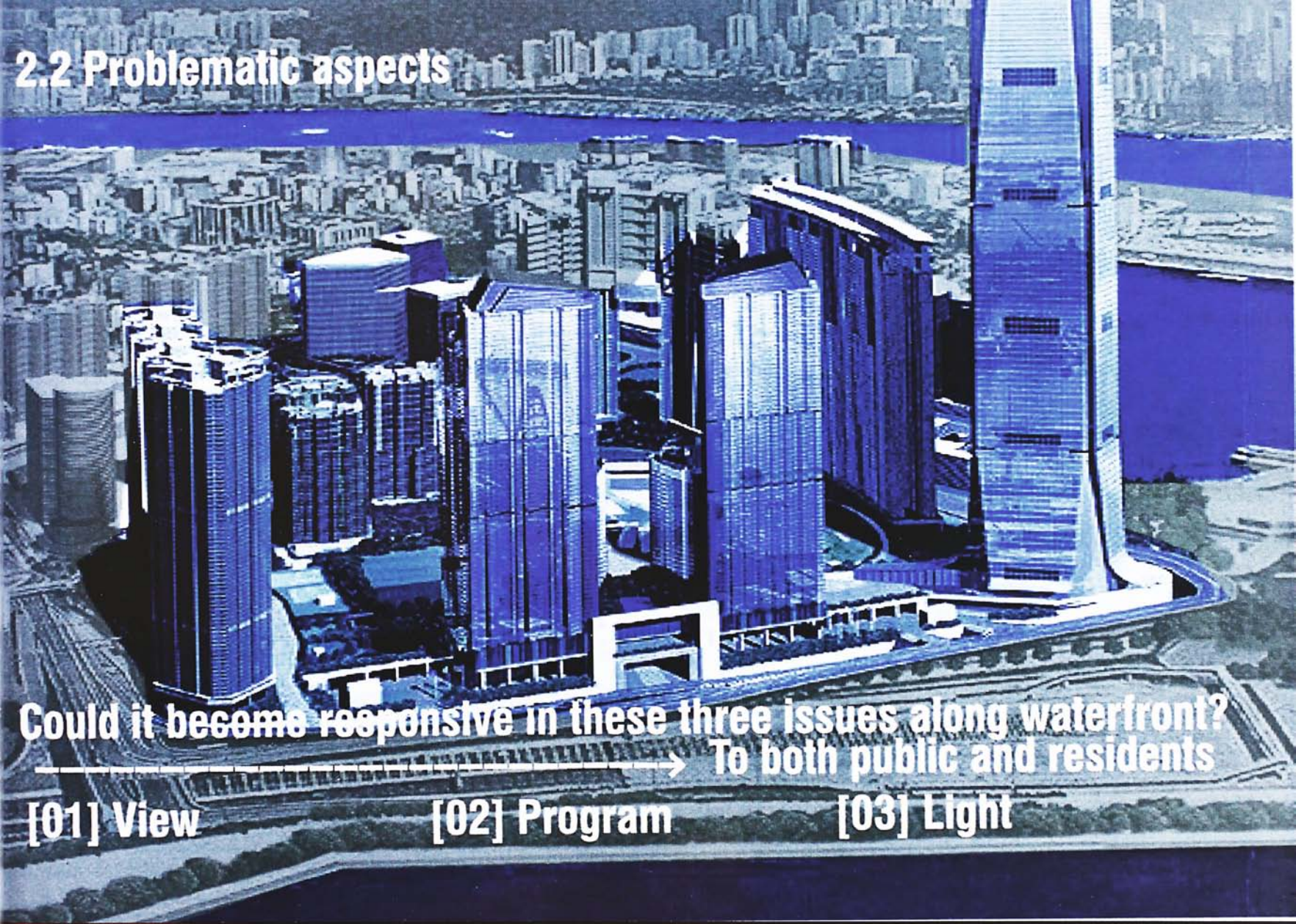
**KKL SIZE** sea view  
**SPECTACULAR Pan-harbour views**

Unit No. 2007-101  
Units: 2007  
Power: 3  
Levels: +00  
Size: 18,900 sq.m.  
Developer:  
Henderson & Co.



Functionalism was applied most popularly in zoning theory. In Western society, architecture and city are in fundamental opposition to nature. Stout walls divide outside from inside, city ramparts clearly establish boundaries between the city and natural landscape.





## 2.2 Problematic aspects

Could it become responsive in these three issues along waterfront?  
→ To both public and residents

[01] View

[02] Program

[03] Light

**[ Research ]**



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# 3.1 Precedent Studies - Contextual Figure and Ground

[01]\_Courtyard housing\_Borneo Sporenburg

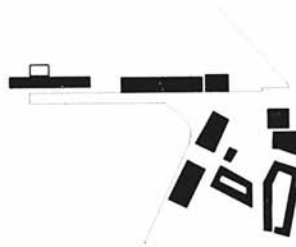


Location: Amsterdam, NL  
 Authors: Frits Van Dongen  
 Floors: 12  
 Basement: 1  
 Size: 100 x 50 m

Date: 2000  
 Site area: not available  
 Other uses: Offices, retail  
 Plot Ratio: 7  
 Type: Single-loaded



[02]\_Linear housing\_Silodam



Location: Amsterdam, NL  
 Authors: MVRDV  
 Floors: 10  
 Basement: N/A  
 Size: 120 x 20 m

Date: 2002  
 Site area: 2,600 sq.m  
 Other uses: Offices, workspace  
 Retail  
 Plot Ratio: 10  
 Type: Double-loaded



[03]\_U Type housing\_Interface



Location: Singapore  
 Authors: OMA  
 Floors: 24  
 Basement: 1  
 Size: 100 x 20 m

Date: 2010  
 Site area: N/A  
 Other uses: Workspace, retail  
 Plot Ratio: 2.1  
 Type: Single-loaded



[04]\_L Type housing\_Shinonome Canal Court



Location: Tokyo, Japan  
 Authors: Riken Yamamoto  
 Floors: 14  
 Basement: 1  
 Size: Multi

Date: 2005  
 Site area: 47,800 sq.m  
 Other uses: School, retail, office  
 Plot Ratio: 4.8-5.4  
 Type: Multi



[05]\_Hybrid Type housing\_Shinonome Canal Court

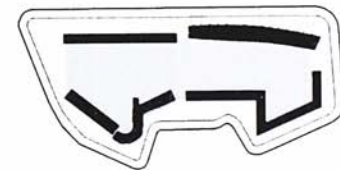


Location: Tokyo, Japan  
 Authors: Riken Yamamoto  
 Floors: 14  
 Basement: 1  
 Size: Multi

Date: 2005  
 Site area: 47,800 sq.m  
 Other uses: School, retail, office  
 Plot Ratio: 4.8-5.4  
 Type: Multi

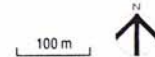


[06]\_Zig zag type housing\_Gifu Apartment



Location: Gifu, Japan  
 Authors: Kazuyo Sejima  
 Floors: 10  
 Basement: 1  
 Size: 200 x 10 m

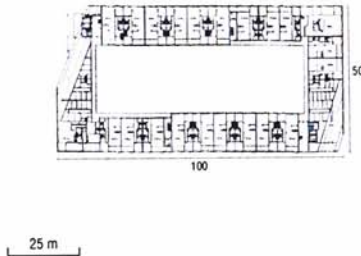
Date: 1998  
 Site area: 4,706 sq.m  
 Other uses: -  
 Plot Ratio: 7.8  
 Type: Single-loaded



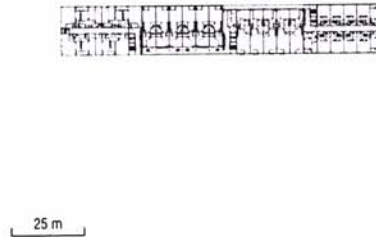


## 3.2 Precedent Studies - *Planar Proportion and dimension*

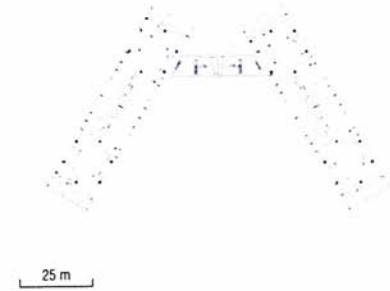
[01] Courtyard housing\_Borneo Sporenburg



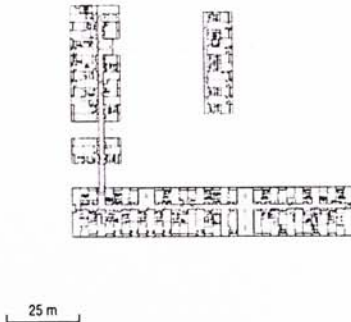
[02] Linear housing\_Silodam



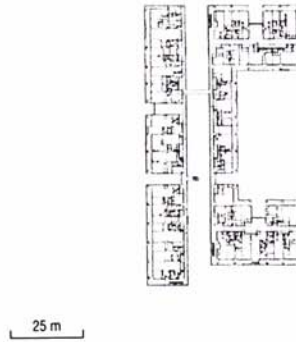
[03] U Type housing\_Interface



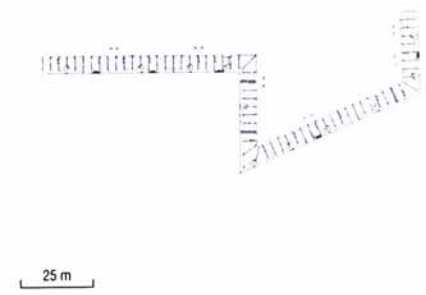
[04] L Type housing\_Shinonome Canal Court



[05] Hybrid Type housing\_Shinonome Canal Court



[06] Zig zag type housing\_Gifu Apartment



# 3.3 Precedent Studies - Planar Programme

*Legend*

<span style="color: red;">■</span> Bedroom	<span style="color: green;">■</span> Corridor	<span style="color: grey;">■</span> Service area
<span style="color: red;">■</span> Kitchen/ toilet	<span style="color: yellow;">■</span> Semi- public area	<span style="color: blue;">■</span> Parking
<span style="color: pink;">■</span> Living Room	<span style="color: orange;">■</span> public amenities	<span style="color: lightblue;">■</span> Undefined area
<span style="color: pink;">■</span> Balcony		

[01]\_Courtyard housing\_Borneo Sporenburg



25 m

[02]\_Linear housing\_Silodam



25 m

[03]\_U Type housing\_Interface



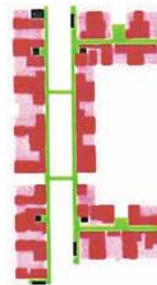
25 m

[04]\_L Type housing\_Shinonome Canal Court



25 m

[05]\_Hybrid Type housing\_Shinonome Canal Court



25 m

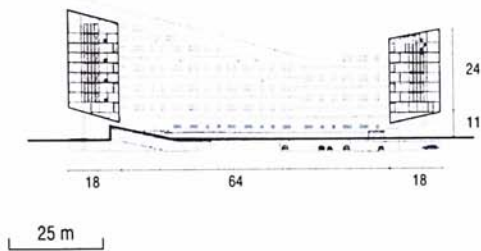
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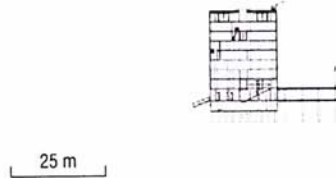
25 m

## 3.4 Precedent Studies - *Sectional Proportion and dimension*

[01] Courtyard housing\_Borneo Sporenburg

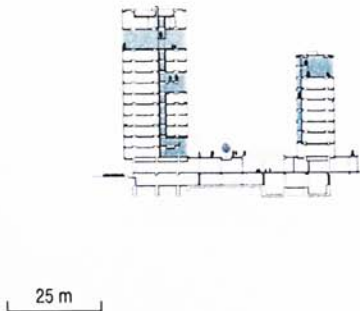


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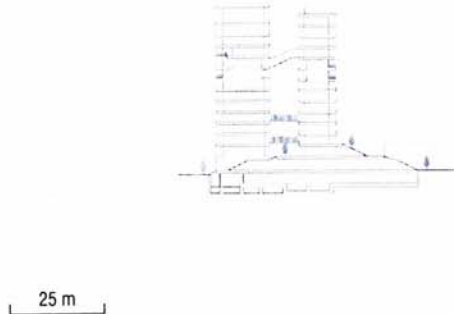


[03] U Type housing\_Interlace

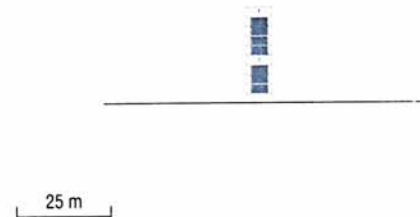
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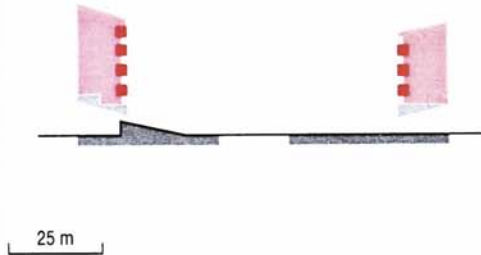


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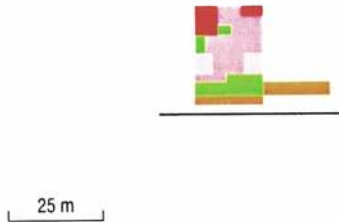


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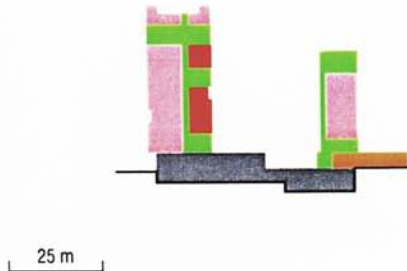


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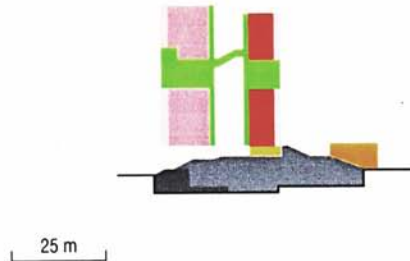


[03] U Type housing\_Interlace

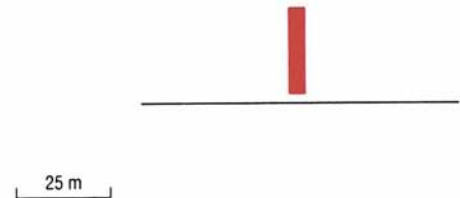
[04] L Type housing\_Shinonome Canal Court



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[06] Zig zag type housing\_Gifu Apartment





## 3.6 Precedent Studies - Photo

[01] Courtyard housing\_Borneo Sporenburg



[02] Linear housing\_Silodam



[03] U Type housing\_Interlace



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# 4.0 Waterway Analysis

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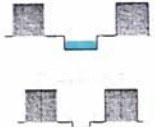













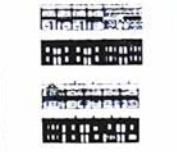





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# 4.1 Waterway analysis

	Proportion of space	Program and privacy	Pattern of events	Facade	Photo
[01] One path type Amsterdam					
[02] Two path type Utrecht, Oudegracht					
[03] No path type Hamburg, Speicherstadt					
[04] Multiple path type Porto					
[05] Wide path type Hong Kong Soho East					



# 5.0 Environmental Analysis

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### 9.0 Housing Form & Sunlight Hour

- 9.1 Generic Development Problems
- 9.2 Criteria Setting
- 9.3 Strategy to Waterfront Context
- 9.4 Strategy to public open space
- 9.5 Strategy to Commercial open space & Street
- 9.6 Final Result
- 9.7 Integration with Diamond Grid
- 9.8 Integration Final Result

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- 10.8 1: 200 Housing Model



## 5.1 Environmental analysis - *Hong Kong Natural Coastal Typology*



[1] Grass Coast - Gau Leng Chung river mouth



[2] Beach - Shek Piu



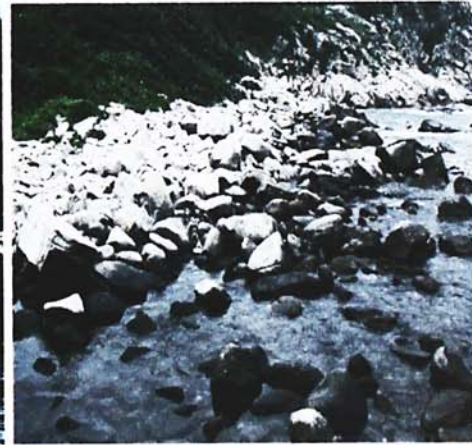
[3] Island - Pak Sha Tau Chau



[4] Rock Cliff - Fu Tau Chau

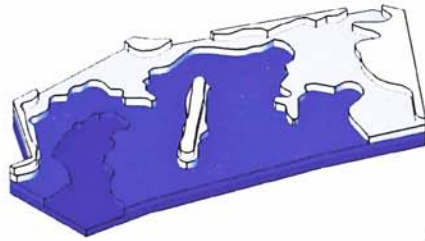


[5] Sea Arch - Ap Chau

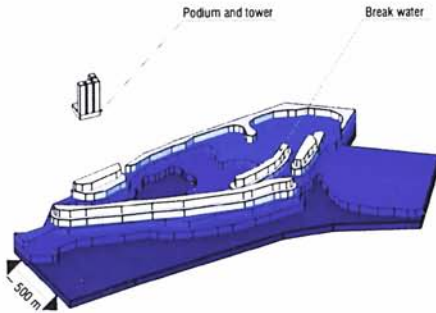


[6] Rock - Tai Tau Chau

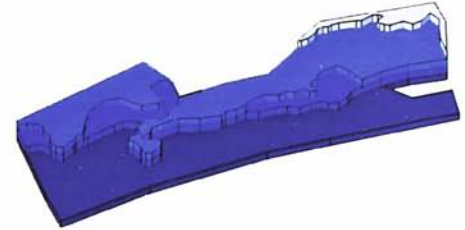
## 5.2 Environmental analysis - *Under Sea level Contour*



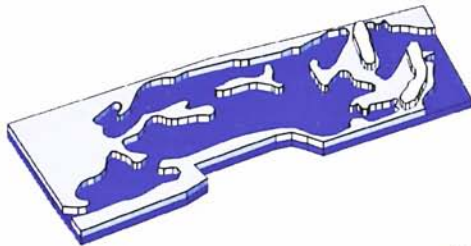
[1] To Kwa Wan



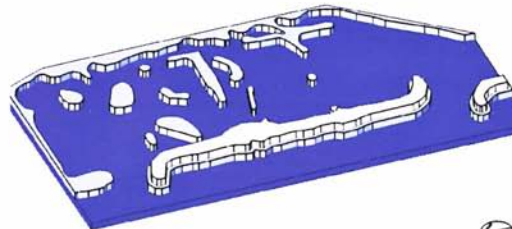
[2] Shau Kei Wan



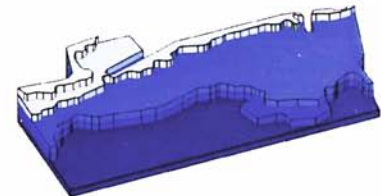
[3] Central



[4] Kwun Tong

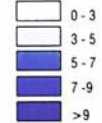


[5] Yau Ma Tei



[6] Wan Chai

[m] metres of land under  
water table



## 5.3 Environmental analysis - *Tidal change and Typhoon surges*

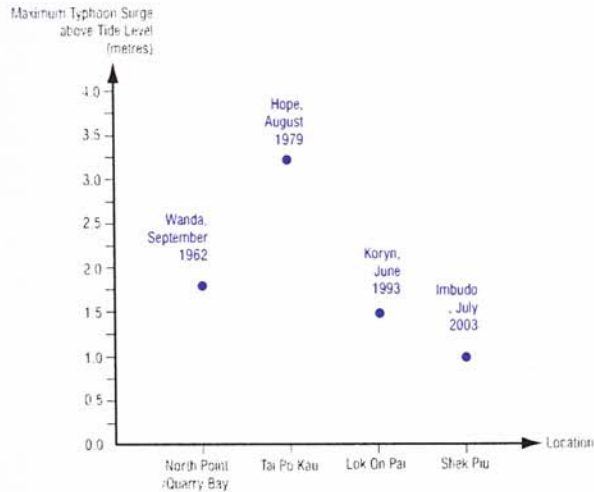


Diagram recording the maximum Typhoon Surges above Tidal Level in Hong Kong

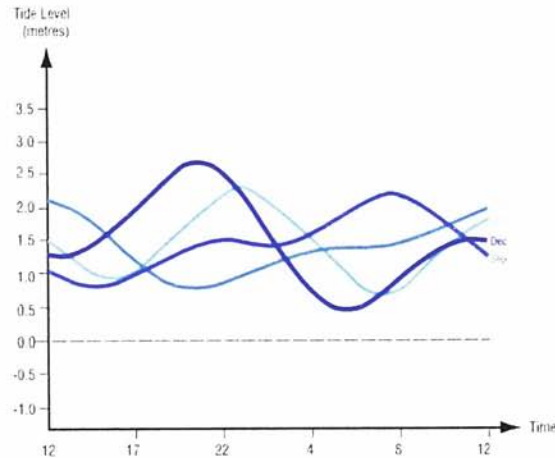


Diagram recording the tidal change in the starting day of each season

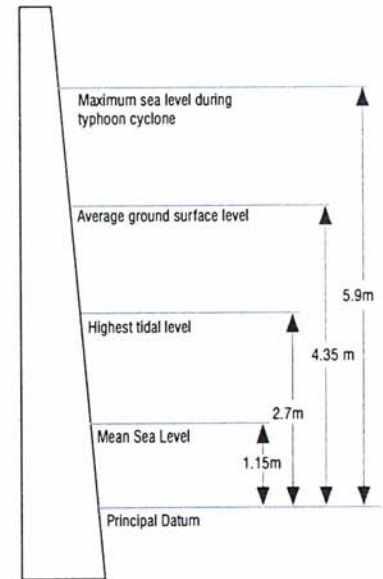


Diagram recording resulting maximum levels in normal and typhoon cyclone



# 6.0 Site Intervention

## [Introduction]

### 1.0 Inspiration

- 1.1 Theory - "a city is not a tree"
- 1.2 Theory - Symbiosis
- 1.3 Buffer zone in nature- Rock

### 2.0 Issue

- 2.1 Urban Phenomenon
- 2.2 Problematic aspects

## [Research]

### 3.0 Precedent Studies

- 3.1 Contextual Figure and Ground
- 3.2 Planar Proportion and Dimension
- 3.3 Planar Programme
- 3.4 Sectional Proportion and Dimension
- 3.5 Sectional Programme
- 3.6 Photo

### 4.0 Waterway analysis

### 5.0 Environmental analysis

- 5.1 Hong Kong Natural coastal Typology
- 5.2 Under Sea Contour
- 5.3 Tidal change and Typhoon surge

## 6.0 Site Intervention

- 6.1 Waterfront Accessibility
- 6.2 Transportation
- 6.3 Public Amenities and Greenery

## [Design]

### 7.0 Grid Layout

- 7.1 Grid Transformation
- 7.2 Adaptation to Waterfront Geometry

### 8.0 Urban Structure

- 8.1 Fabric, Network & Programme Distribution
- 8.2 Sectional Network System
- 8.3 Overall Geometry Definition
- 8.4 Overall Network Definition

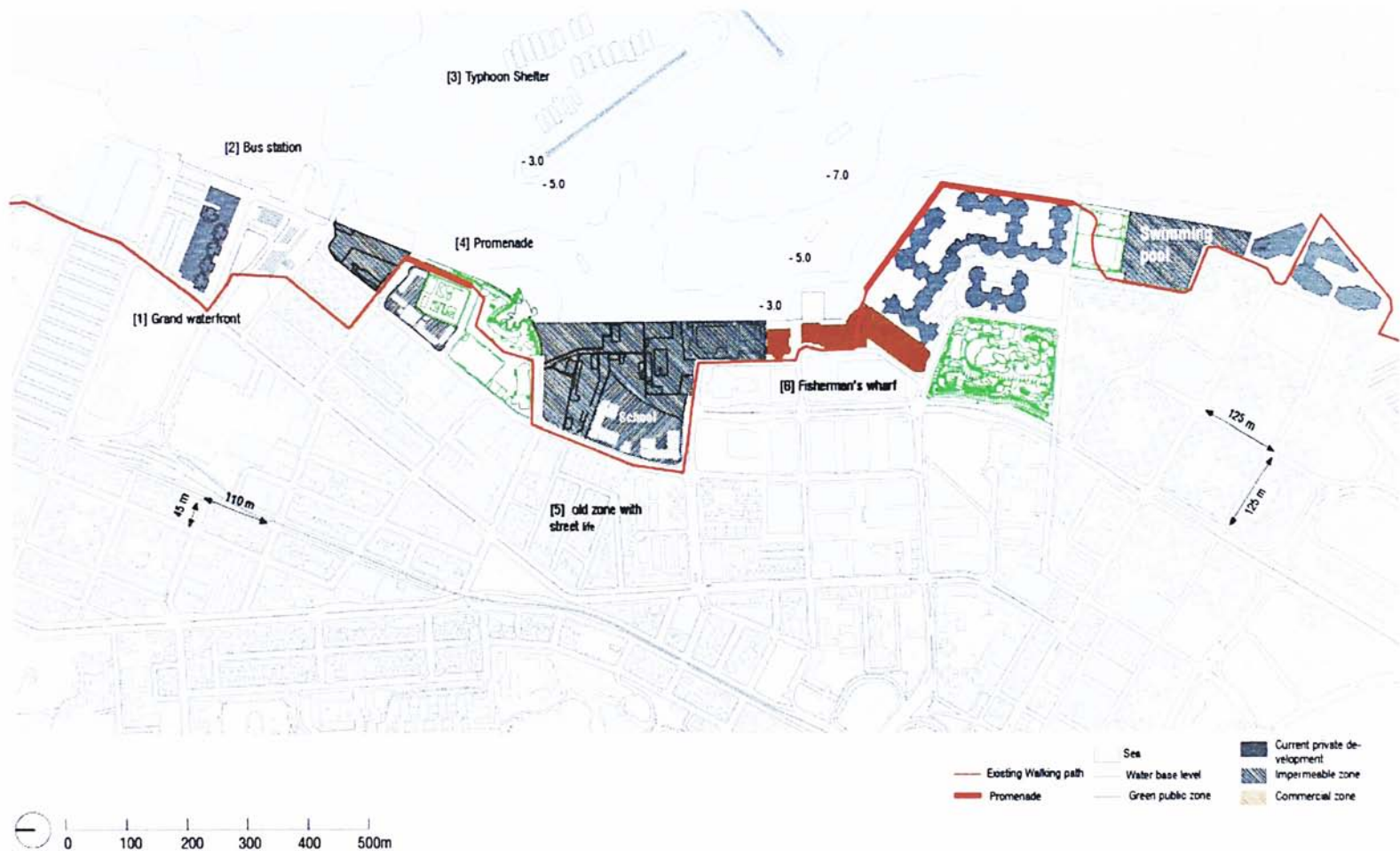
### 9.0 Housing Form & Sunlight Hour

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- 9.7 Integration with Diamond Grid
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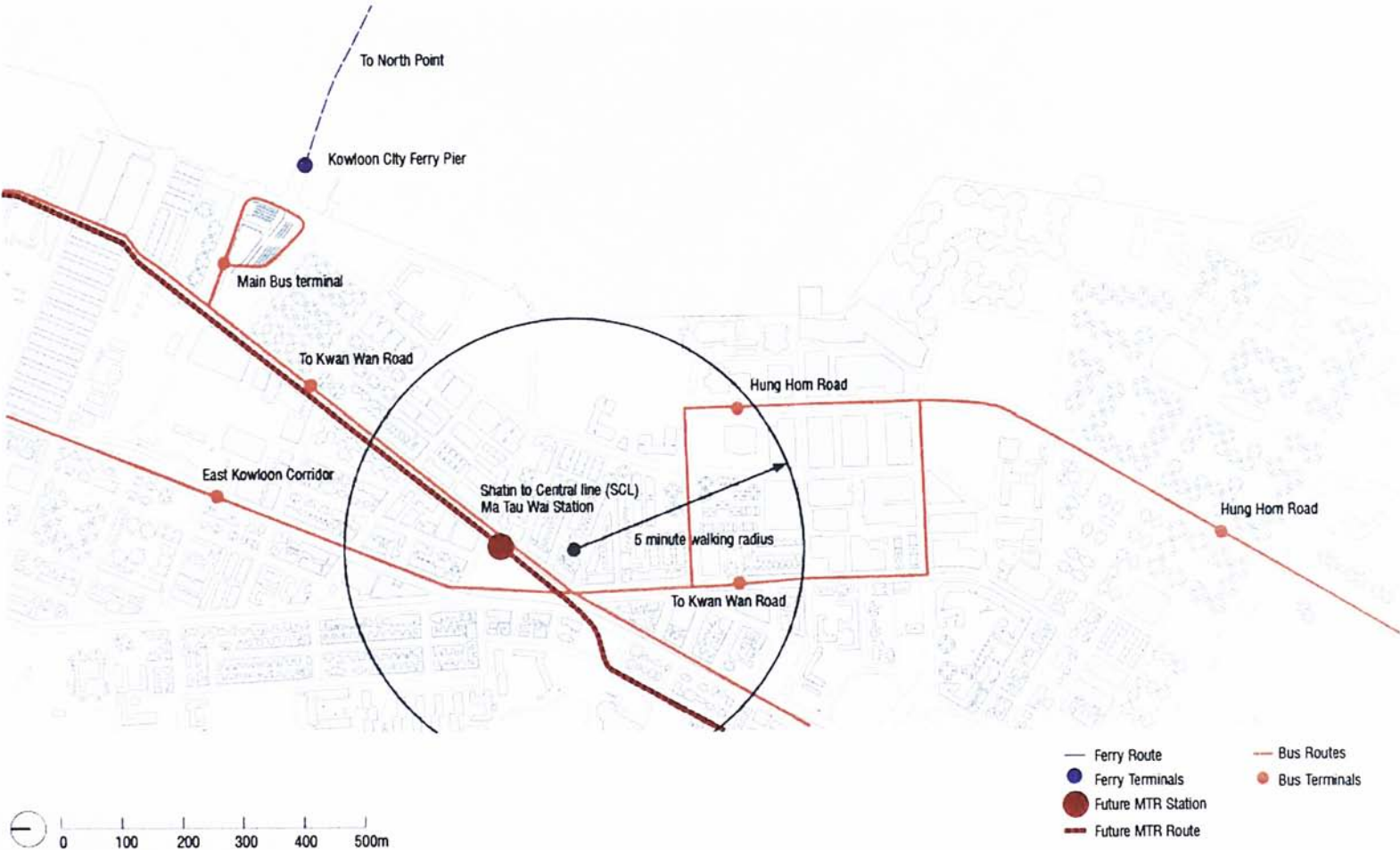
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## 6.1 Site Intervention - *Waterfront Accessibility*

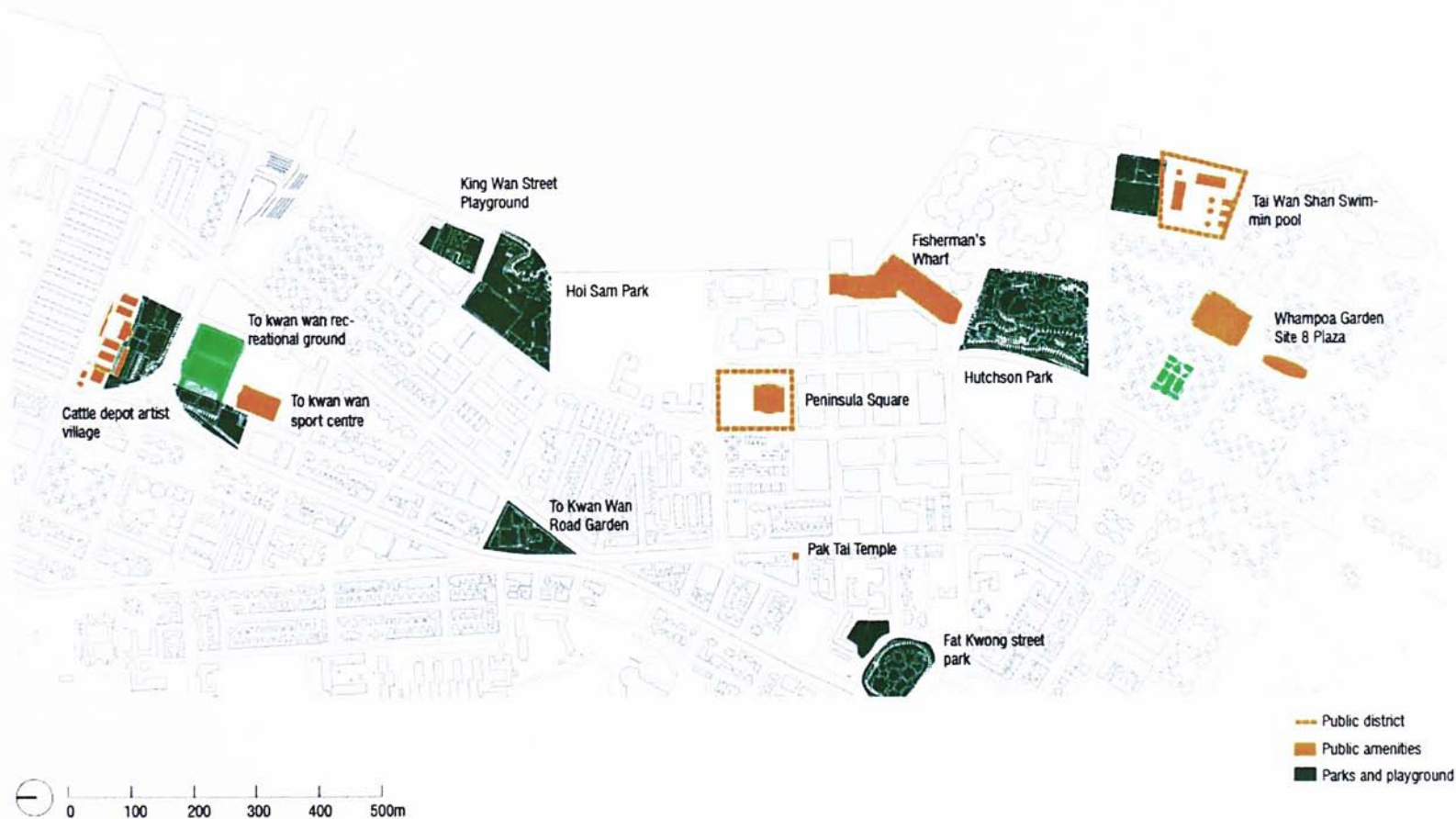




# 6.2 Site Intervention - Transportation



## 6.3 Site Intervention - *Public Amenities and Greenery*



**[ Design ]**



# 7.0 Grid Layout

## [Introduction]

### 1.0 Inspiration

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- 1.3 Buffer zone in nature- Rook

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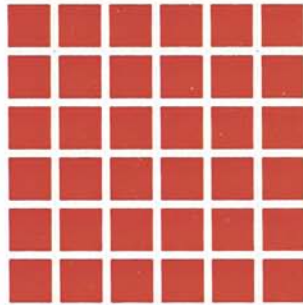
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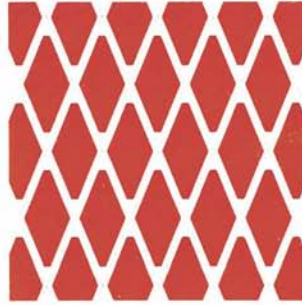
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## 7.1 Grid Layout - *Grid Transformation*



Generic square grid



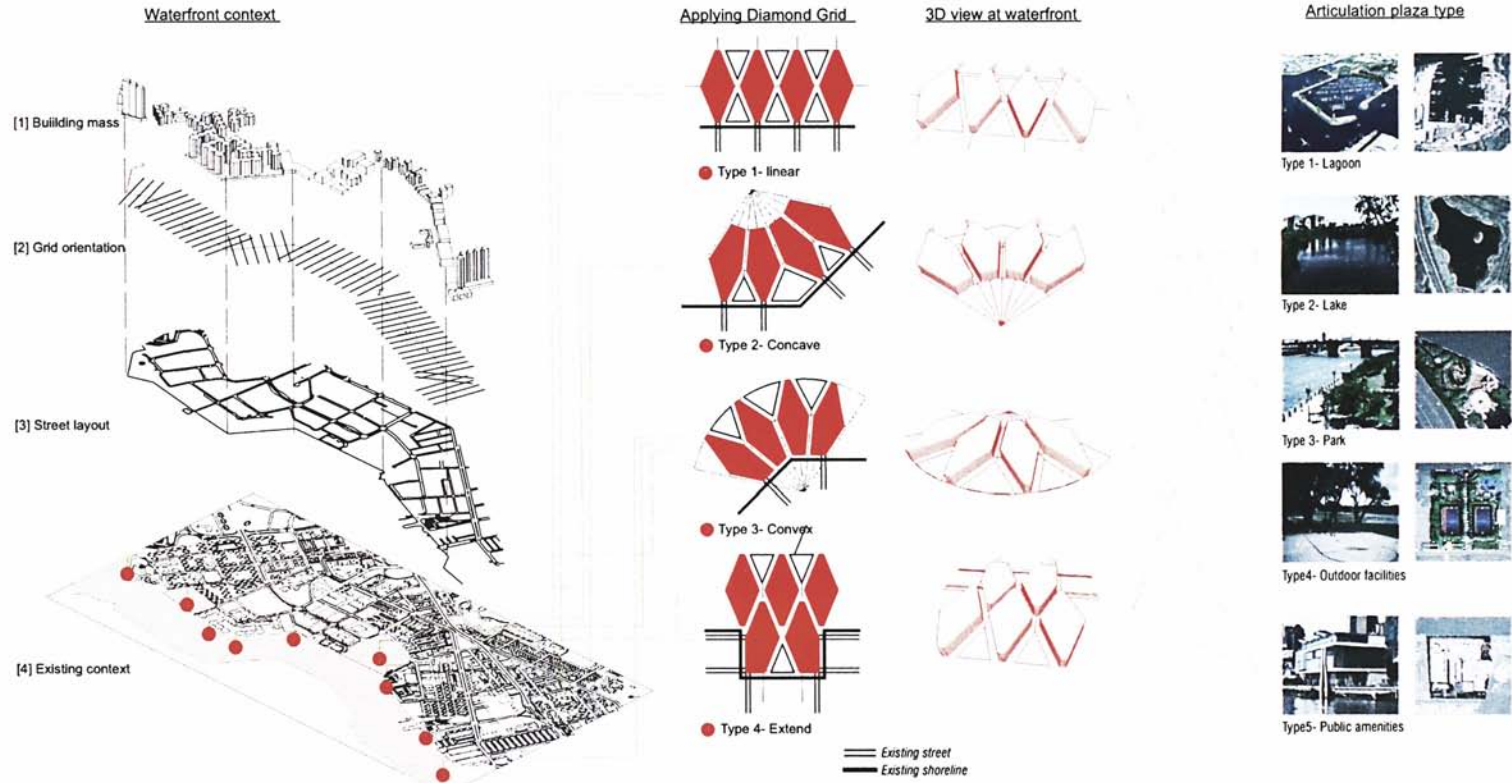
New Diamond grid



Elongated Depth of View

*The 100m x 100m generic square grid is transformed to diamond grid with new proportion of 1 : 2 elongated proportion which facilitates the movement of walkway and waterway.*

## 7.2 Grid Layout - Adaptation to waterfront Geometry



So as to adapt to the diverse street layout in waterfront, the diamond is then adapted into 4 types: [1] linear [2] concave [3] convex [4] extend so that the grid can apply to the overall waterfront. However, along the connection between new grid and old city, articulation plaza must be provided. The types included lagoon, lake, park, public amenities and outdoor facilities.



# 8.0 Urban Structure

## [Introduction]

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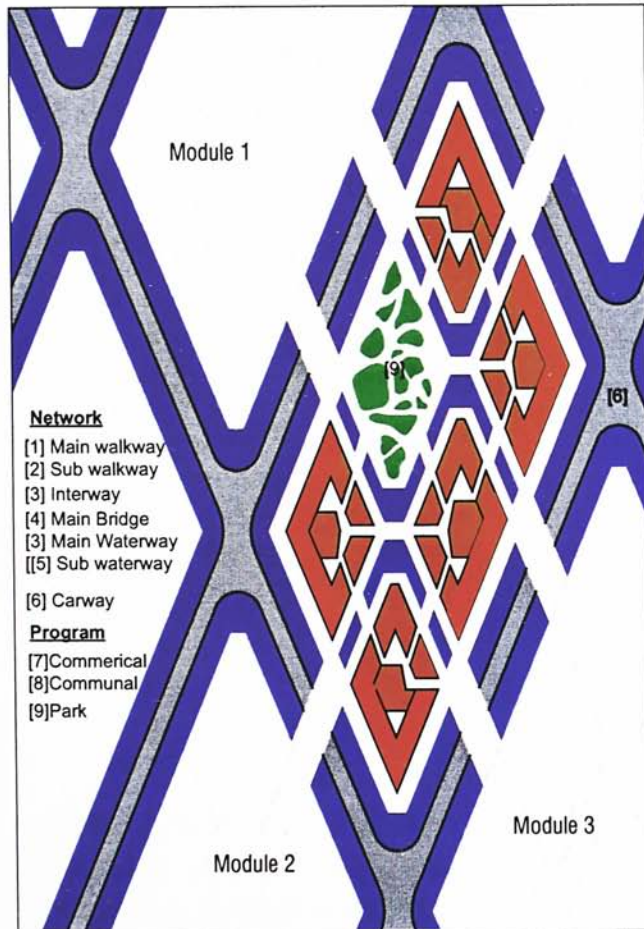
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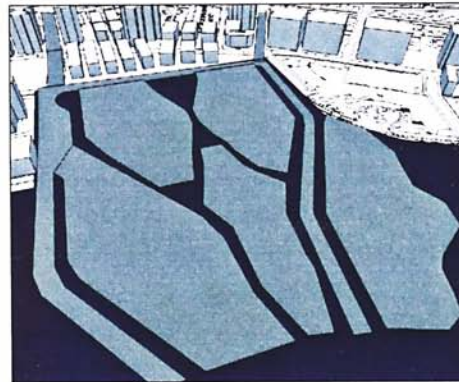
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# 8.1 Urban Structure - *Fabric, Network and programme distribution*

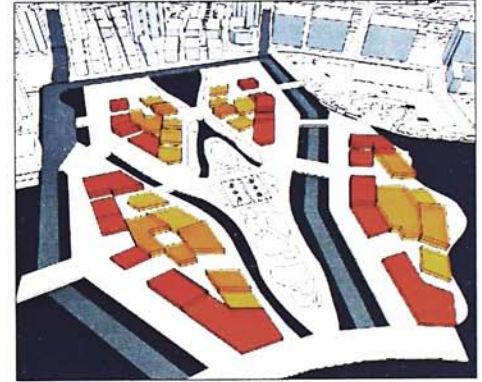
## Ground floor urban structure



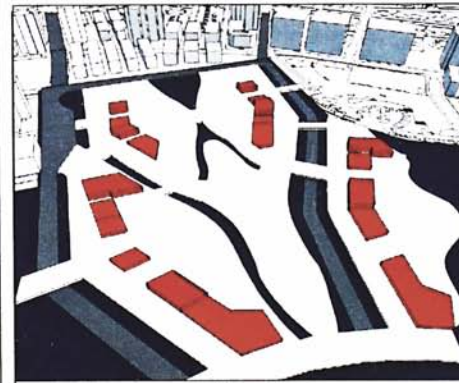
[1] Carway x Under carpark x Waterway



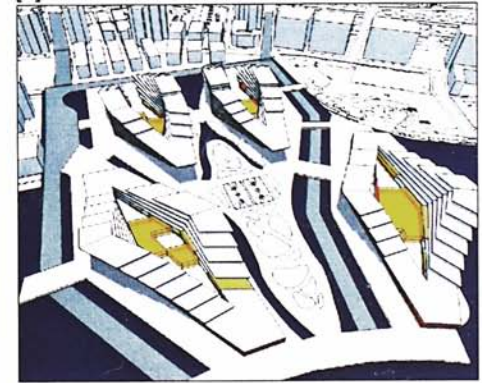
[3] Sub Walkway x Communal Facilities



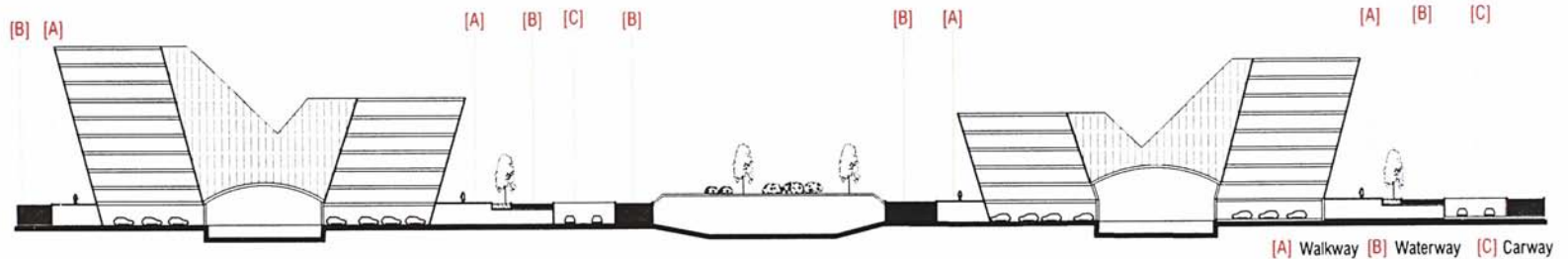
[2] Main Walkway x Commercial facilities



[4] Residential units



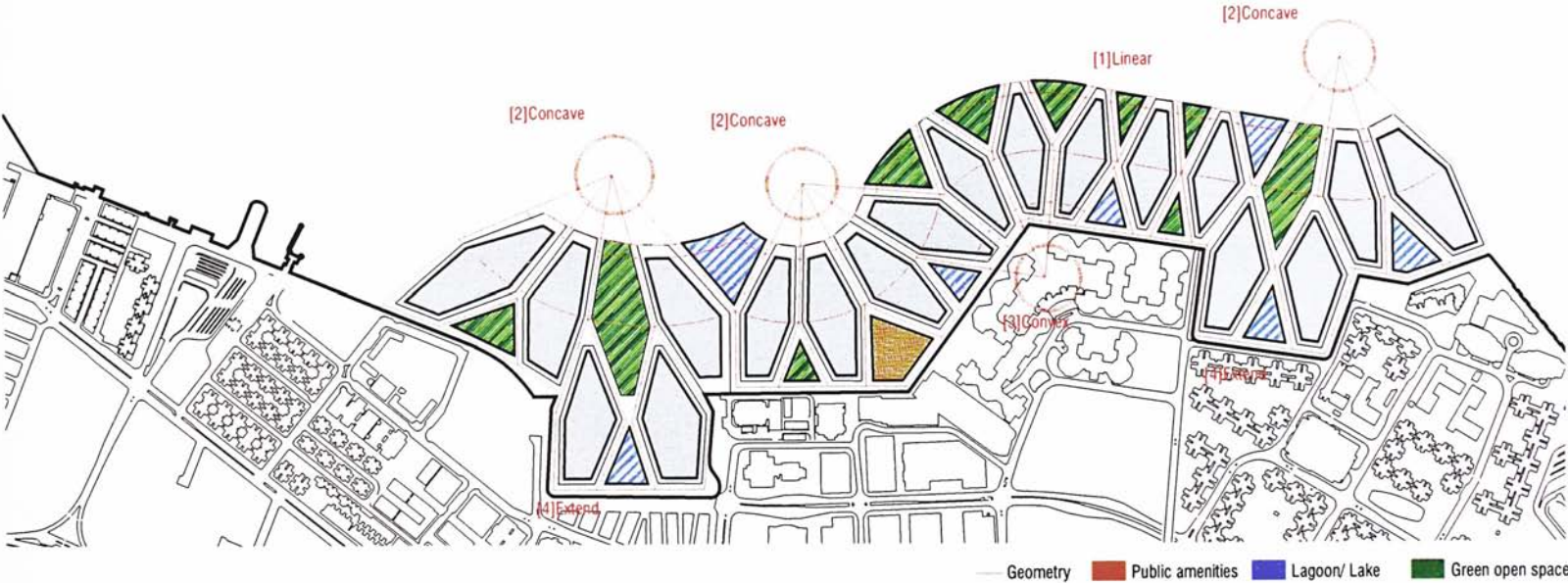
## 8.2 Urban Structure - *Sectional Network System*



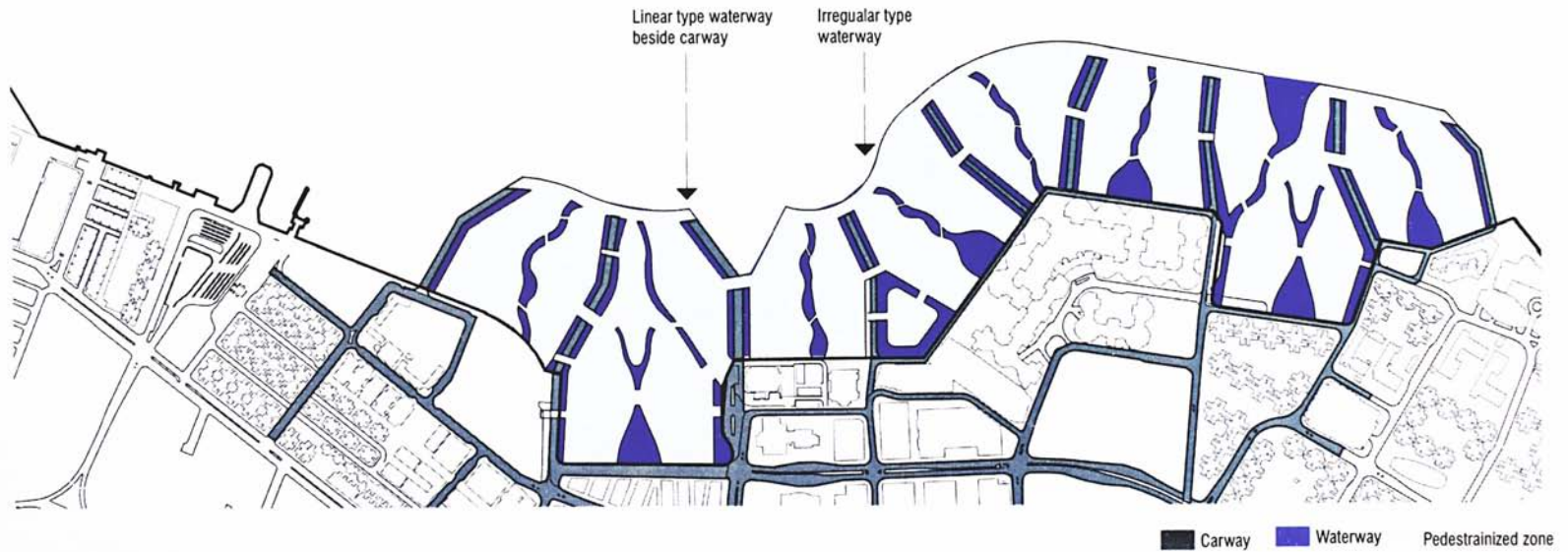
At the same time to minimize the obstruction of view by carway and maximize the connection with waterway, a new urban structure with 3 dimensional network is proposed. New programs are then arranged with commercial along the main walkway and communal program in the sub walkway.



# 8.3 Urban Structure - Overall Geometrial Definition



## 8.4 Urban Structure - Overall Network Definition



# 9.0 Housing Form & Sunlight Hour

## [Introduction]

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## 9.0 Housing Form & Sunlight Hour

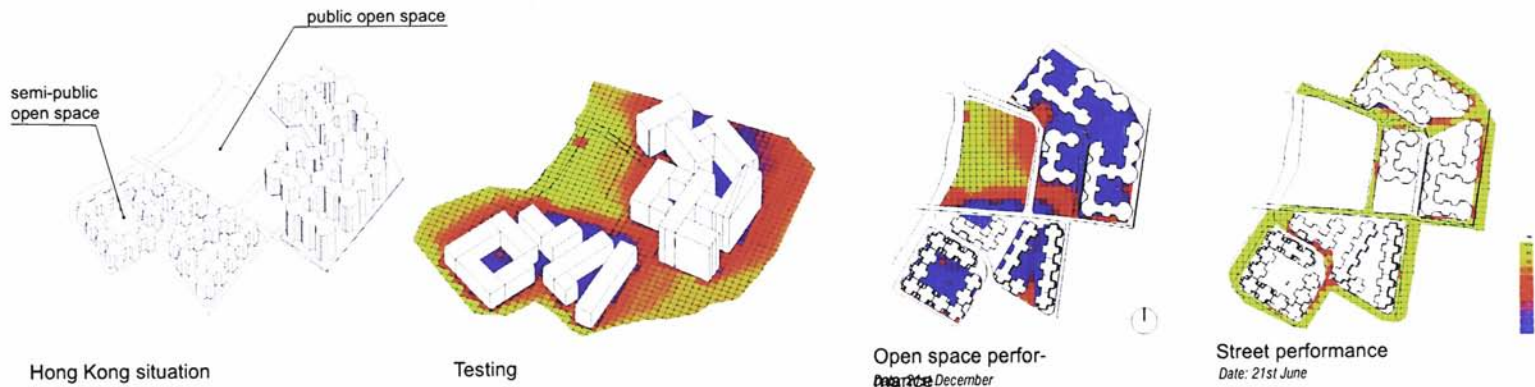
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# 9.1 Housing Form & Sunlight hour - *Generic development Problem*

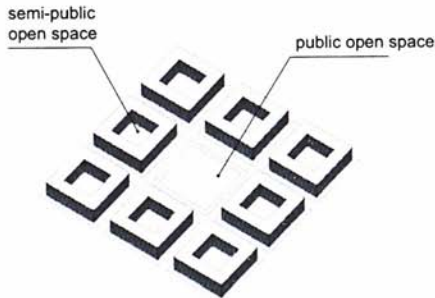


Problem:

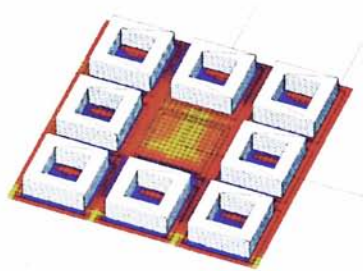
- [1] Existing semi-public space in Hong Kong waterfront do not have enough sunlight exposure in winter
- [2] Part of the sunlight of public open space is blocked by buildings in winter.
- [3] Not enough shading zone is provided for the street in summer time.

**“ Aim: To derive a / groups of building form which improve the lighting quality of waterfront open space ”**

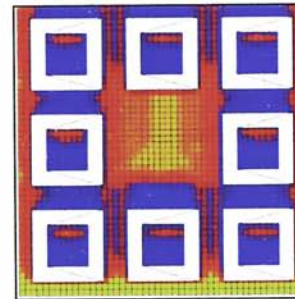
## 9.2 Housing Form & Sunlight hour - *Criteria Setting*



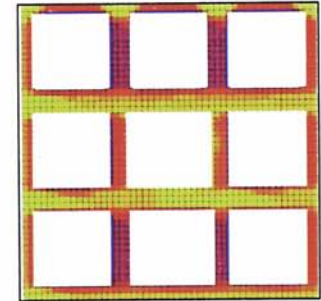
Testing mass



Testing



openspace performance



Street performance

### Criteria:

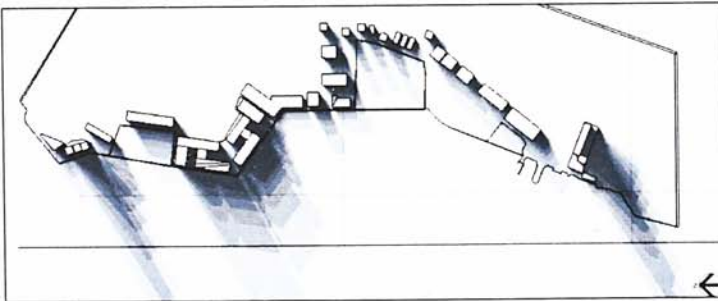
- [1] To obtain almost 3 hours solar exposure for the semi- public open space in 21st December.
- [2] To obtain almost 8 hours solar exposure for the public open space in 21st December
- [3] To provide certain shading zone for the street in 21st June, summer

### Restriction:

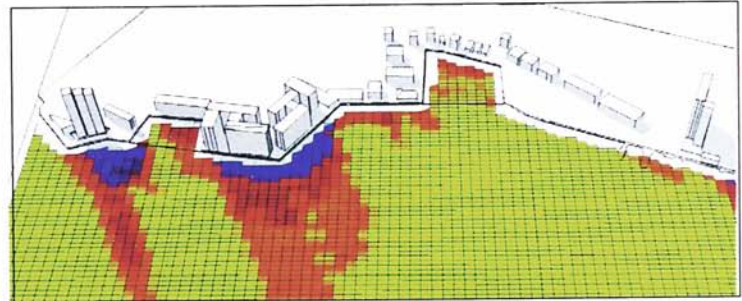
- [1] Plot ratio is constant at 3.5
- [2] Privacy should be retained for the semi public space for the residents
- [3] Building levels cannot exceed 15

## 9.3 Housing Form & Sunlight hour - *Strategy to Waterfront Context*

Existing solar analysis

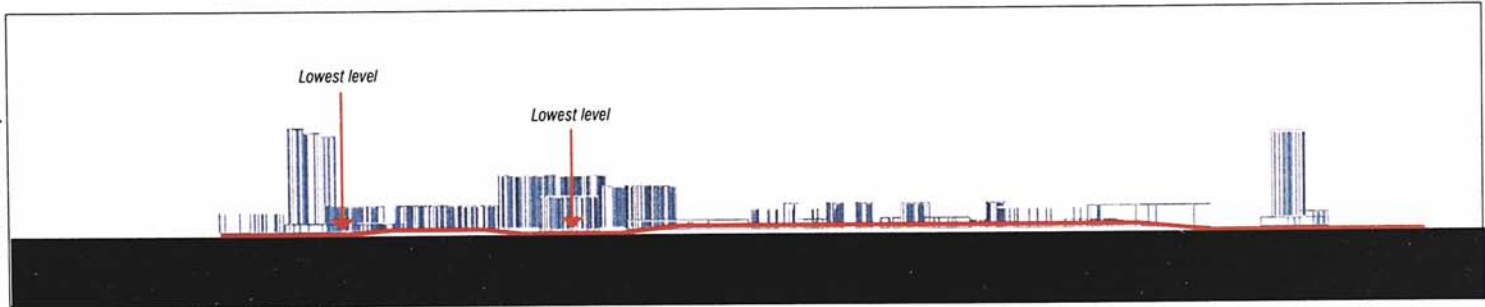


Shadow analysis Time: 14:00- 17:00 at 21st December



Solar access analysis cumulative sunlight hour at 21st December

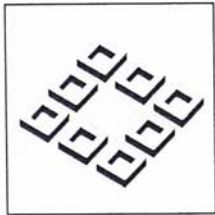
Sectional response



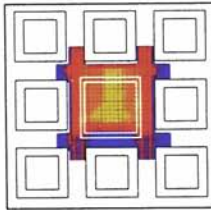


# 9.4 Housing Form & Sunlight hour - *Strategy to public open space*

## [4] Strategy to public open space



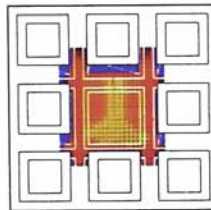
3d



Overall performance



3d



Public open space performance

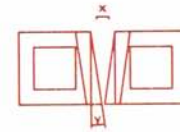


Section

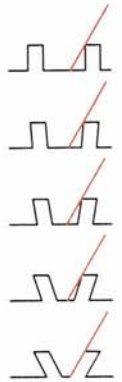
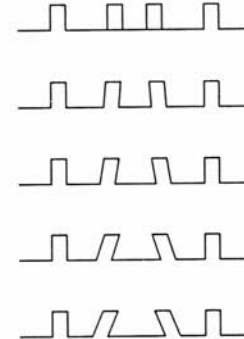


Section

## [6] Proportion testing



increasing distortion rate  
↓

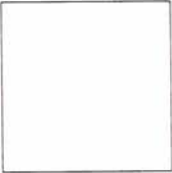


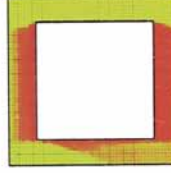


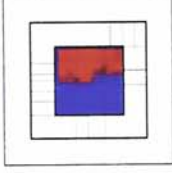
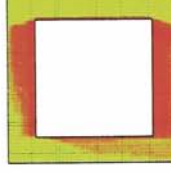


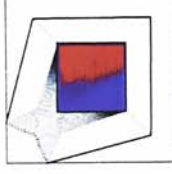
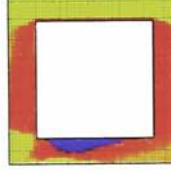

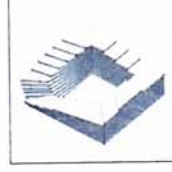
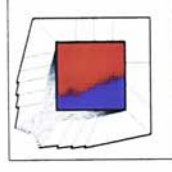
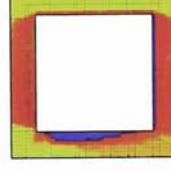


[1] Building height

[2] Building separation

[3] Width of semi-public space

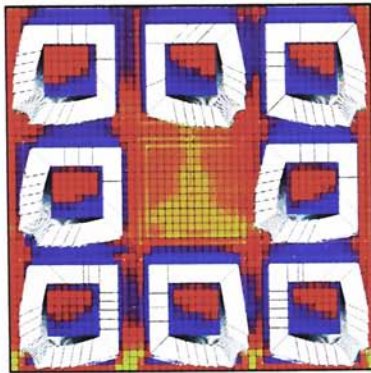
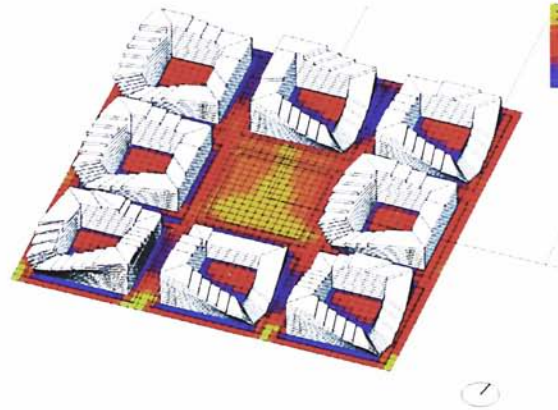
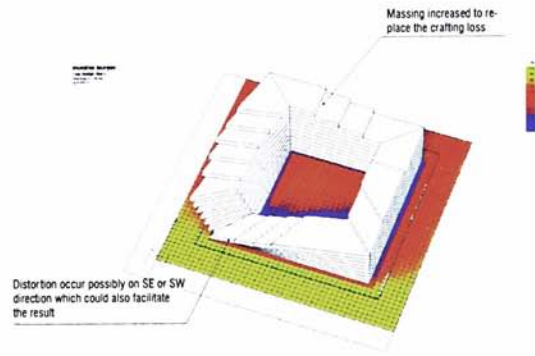
# 9.5 Housing Form & Sunlight hour - *Strategy to Communal open space & Street*

	Counter example	Massing	semi public open space performance	Street performance	Testing result
Generic Block					The generic prototype of today's new development does not allow a shading area for the public in summer solstice. The lighting quality of the open space is also not satisfactory.
Crafting					It used the logic of when sunlight is at the lower position, the building profile also are crafted to let more sunlight to reach.
Distortion					The twisted logic of BIG architecture provide an shading for the public at the summer solstice and in a way allowing more sunlight to the courtyard space.
Combined					The combination of the two logics are very flexible in achieving to get more sunlight in winter solstice but provide shading in summer solstice.

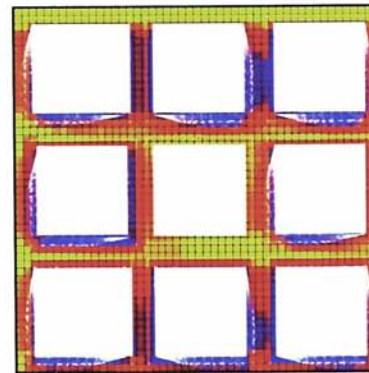
Section

Date: 21st December

## 9.6 Housing Form & Sunlight hour - *Final Result*



Public open space performance

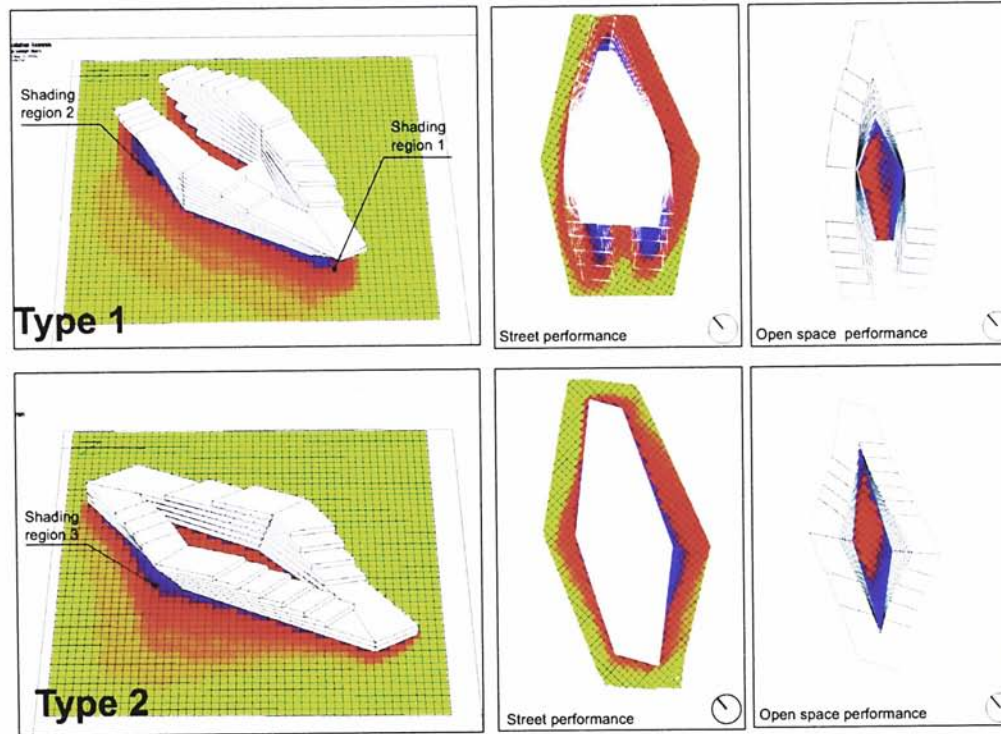


Street performance





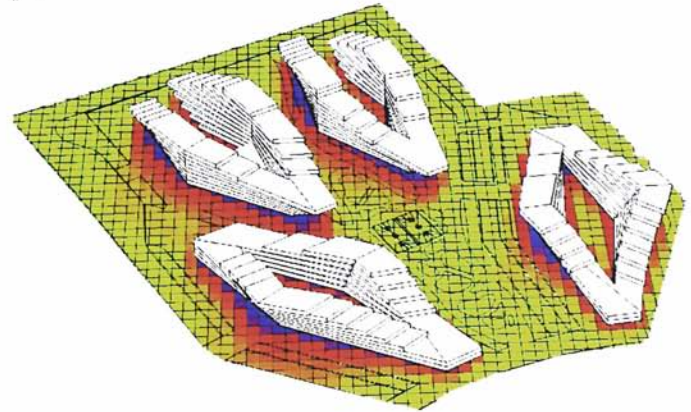
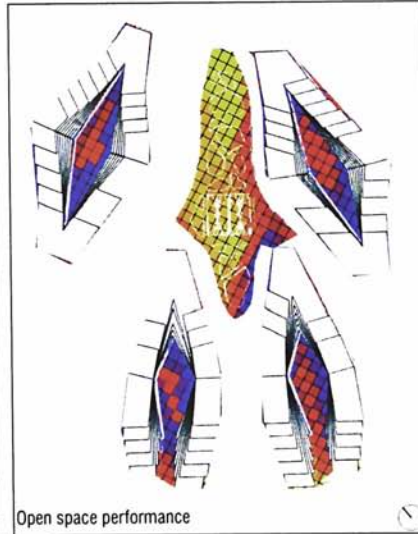
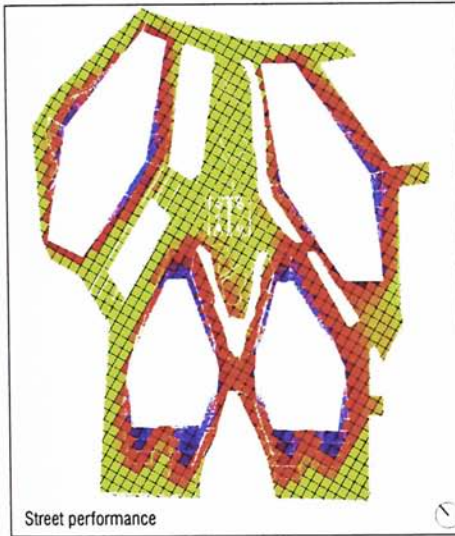
## 9.7 Housing Form & Sunlight hour - *Integration with Diamond Grid*



Application to new waterfront diamond grid system

Since the grid system is varying in direction according to the existing situation in waterfront ---> no generic type is tested. Each new geometry in different situation must be tested. Here the extend type with double layer of grid is chosen as the start testing point.

## 9.7 Housing Form & Sunlight hour - *Integration Final Result*



# 10.0 Design Development

## [Introduction]

### 1.0 Inspiration

- 1.1 Theory - "a city is not a tree"
- 1.2 Theory - Symbiosis
- 1.3 Buffer zone in nature- Rock

### 2.0 Issue

- 2.1 Urban Phenomenon
- 2.2 Problematic aspects

## [Research]

### 3.0 Precedent Studies

- 3.1 Contextual Figure and Ground
- 3.2 Planar Proportion and Dimension
- 3.3 Planar Programme
- 3.4 Sectional Proportion and Dimension
- 3.5 Sectional Programme
- 3.6 Photo

### 4.0 Waterway analysis

### 5.0 Environmental analysis

- 5.1 Hong Kong Natural coastal Typology
- 5.2 Under Sea Contour
- 5.3 Tidal change and Typhoon surge

### 6.0 Site Intervention

- 6.1 Waterfront Accessibility
- 6.2 Transportation
- 6.3 Public Amenities and Greenery

## [Design]

### 7.0 Grid Layout

- 7.1 Grid Transformation
- 7.2 Adaptation to Waterfront Geometry

### 8.0 Urban Structure

- 8.1 Fabric, Network & Programme Distribution
- 8.2 Sectional Network System
- 8.3 Overall Geometry Definition
- 8.4 Overall Network Definition

### 9.0 Housing Form & Sunlight Hour

- 9.1 Generic Development Problems
- 9.2 Criteria Setting
- 9.3 Strategy to Waterfront Context
- 9.4 Strategy to public open space
- 9.5 Strategy to Communal open space & Street
- 9.6 Final Result
- 9.7 Integration with Diamond Grid
- 9.8 Integration Final Result

## 10.0 Design Development

- 10.1 Territorial scale Planar Justification
- 10.2 Fabric scale Planar Justification
- 10.3 Fabric scale Sectional Justification
- 10.4 Building scale Planar Justification
- 10.5 1: 2000 Conceptual Model
- 10.6 1: 1000 Study Model
- 10.7 1: 500 Fabric Model
- 10.8 1: 200 Housing Model



# 10.1 Design Development - Territorial Scale Planar Justification

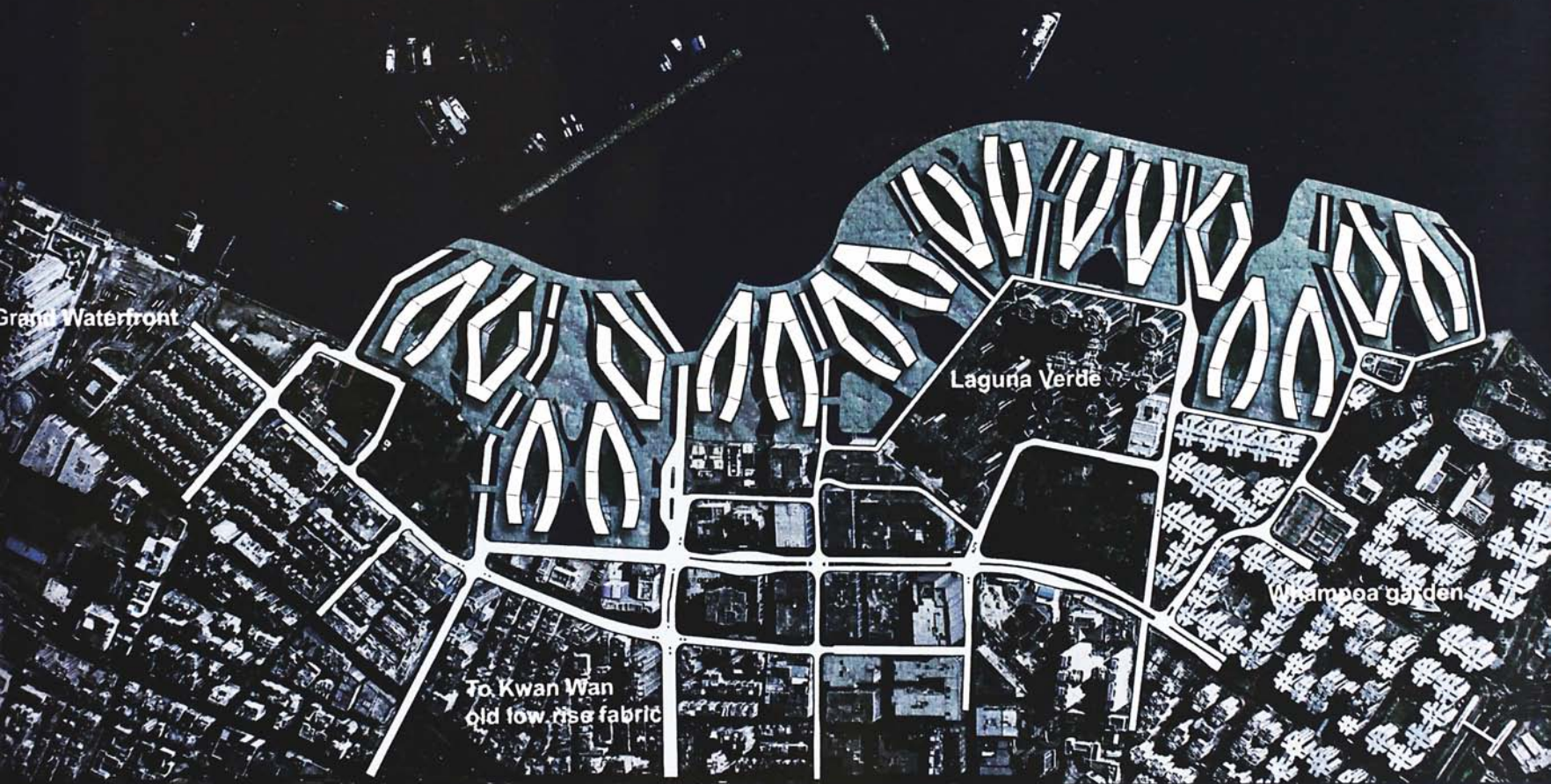


## Master Roof Plan for 32,000 Habitants in To Kwan

Plot ratio : 3.5

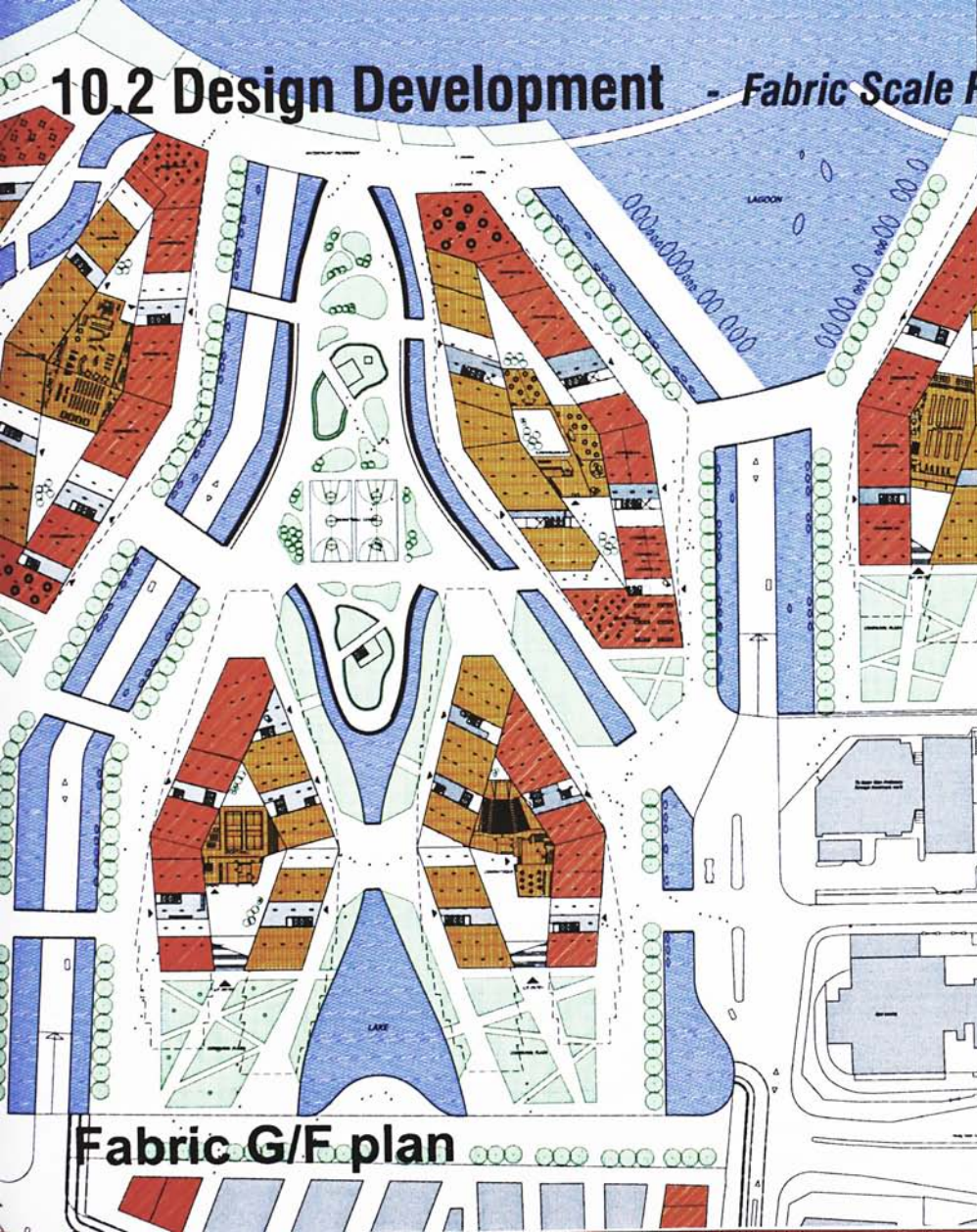
Surface greenery: 73 %

Surface water : 80%





## 10.2 Design Development - Fabric Scale Planar Justification



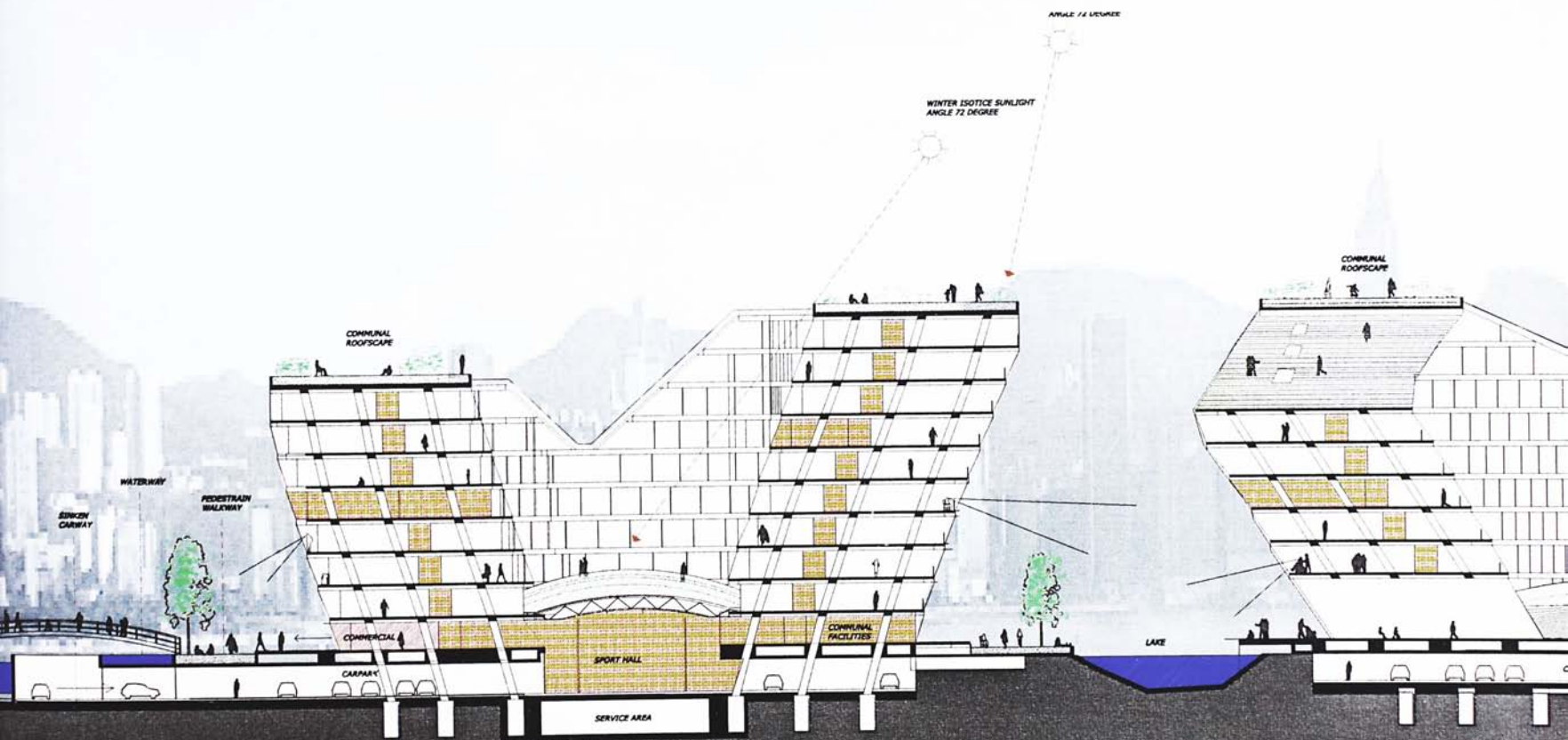
**Fabric G/F plan**



**Fabric Roof plan**




# 10.3 Design Development - Fabric Scale Sectional Justification







# 10.4 Design Development - Building scale Planar Justification



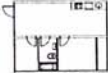
area:400 sq.m  
no. of bedroom: 1  
dimension: 6000 x 6000




area: 900 sq.m  
no. of bedroom: 3  
dimension: 9000 x 10000



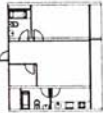
area: 930 sq.m  
no. of bedroom: 2  
dimension: 6000 x 15000



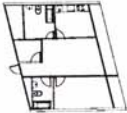
area: 496 sq.m  
no. of bedroom: 1  
dimension: 6000 x 8000



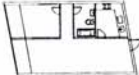
area:1500 sq.m  
no. of bedroom: 3  
dimension: 6000 x 9000



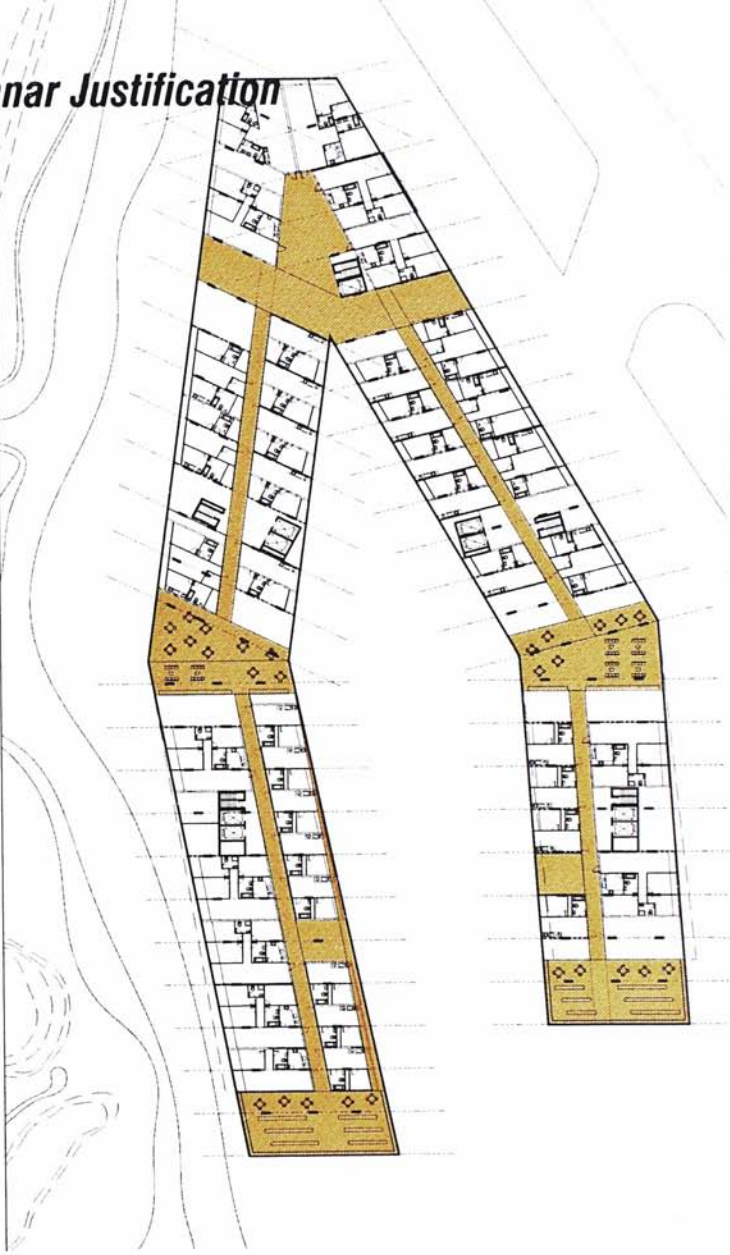
area:736 sq.m  
no. of bedroom: 1  
dimension: 8000 x 9000



area:700 sq.m  
no. of bedroom: 1  
dimension: 8000 x 9000

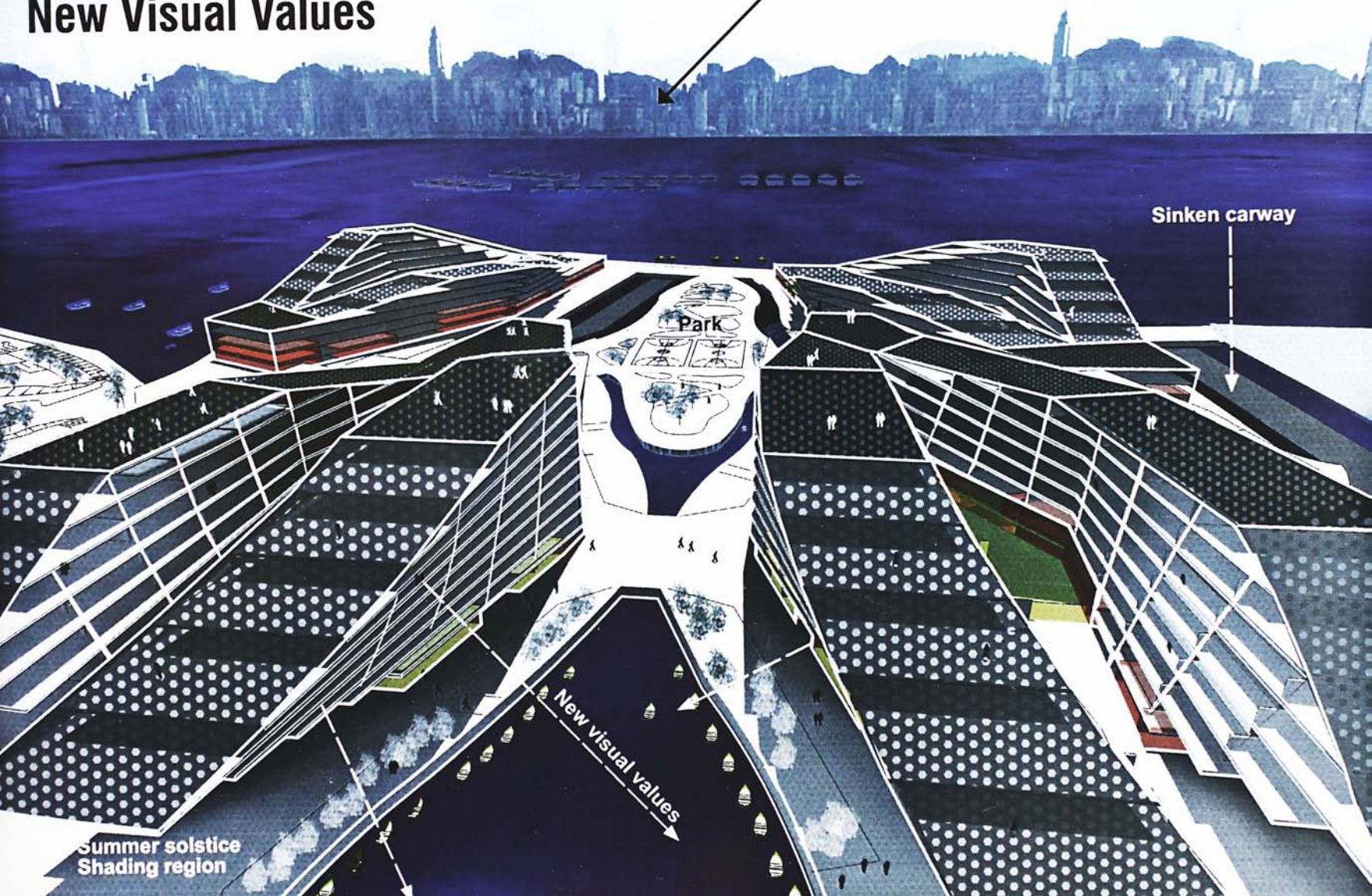


area:600 sq.m  
no. of bedroom: 1  
dimension: 8000 x 6000



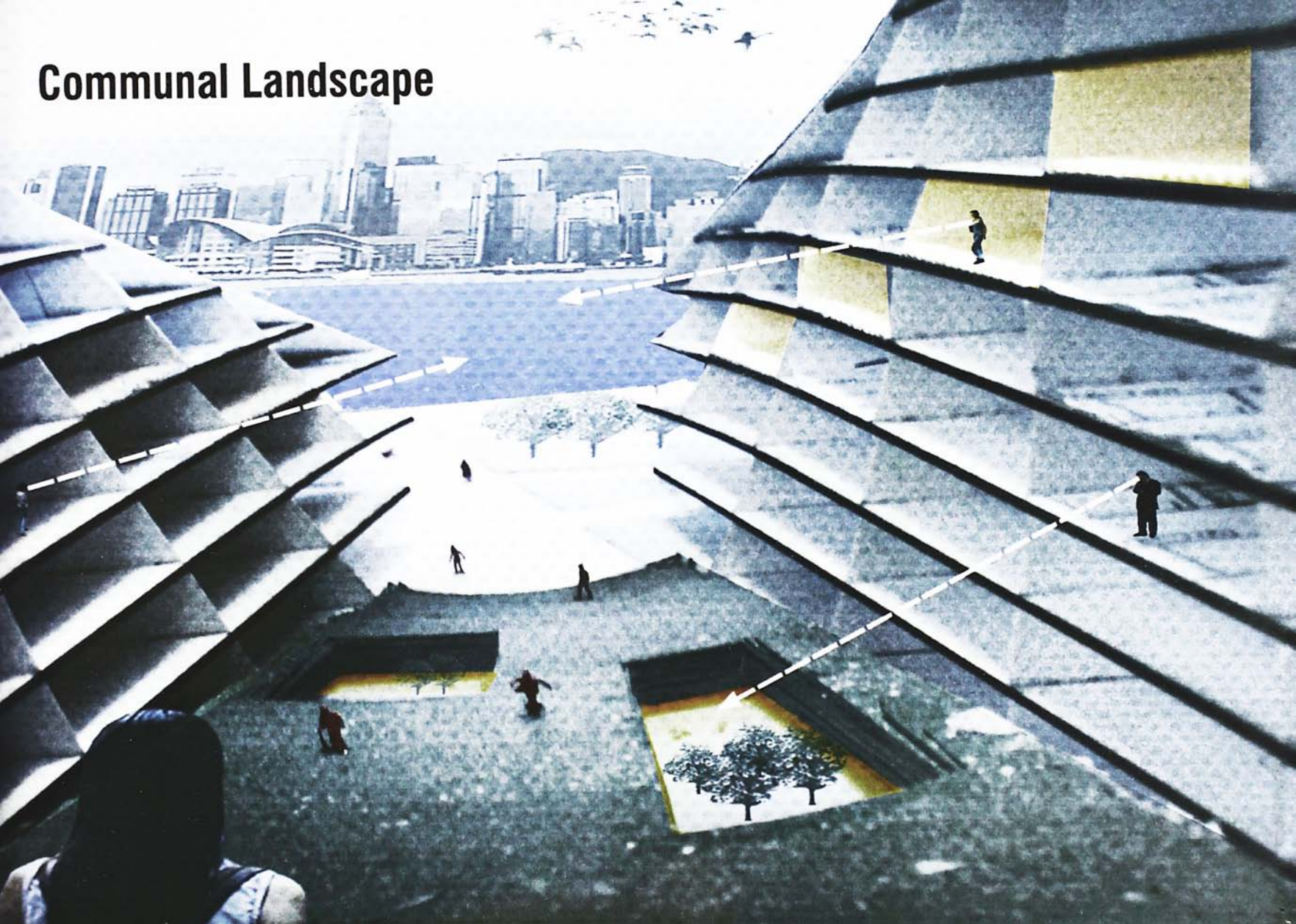
# New Visual Values

Shall we continue to build the generic prototype ?? OR.....



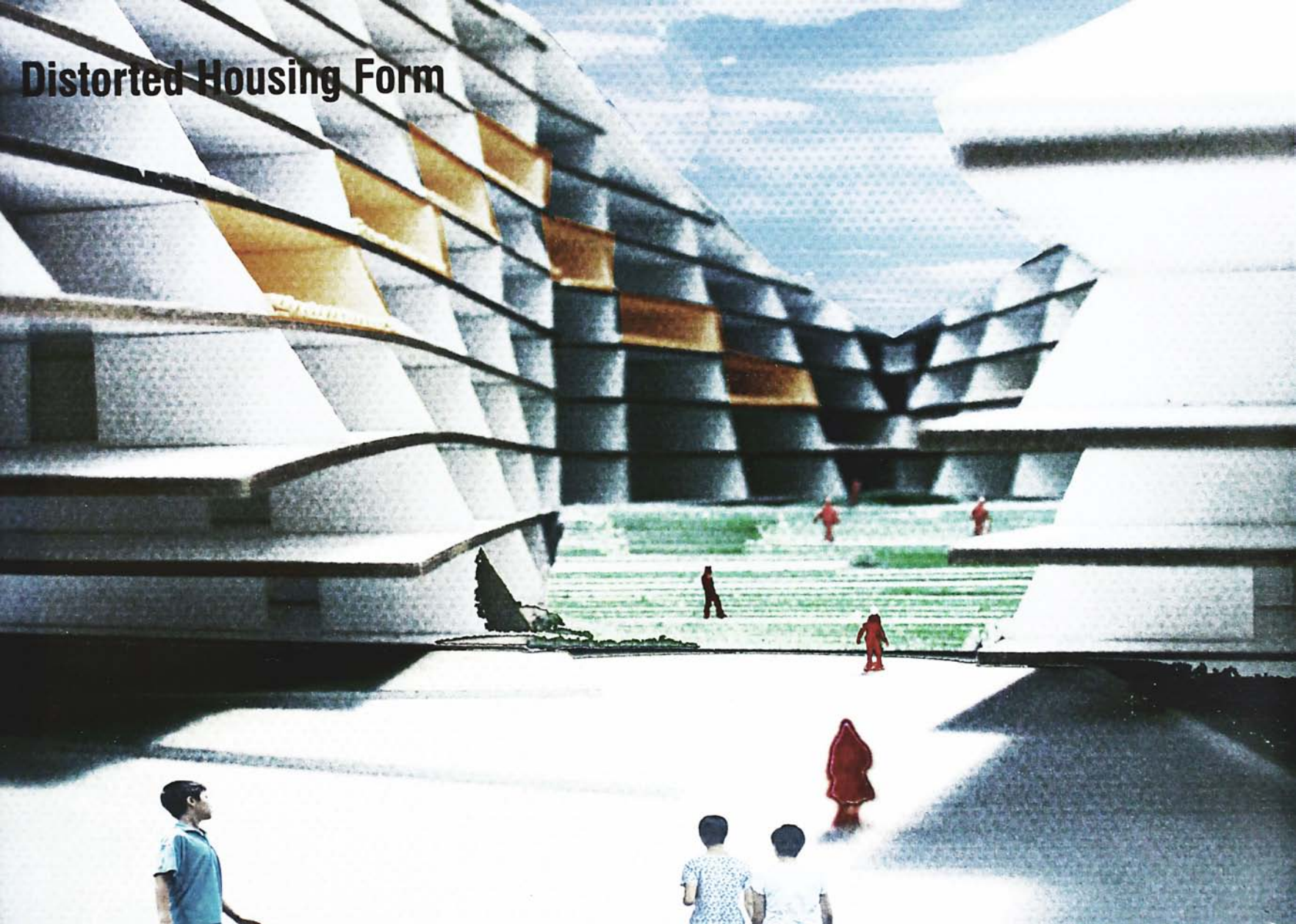


# Communal Landscape

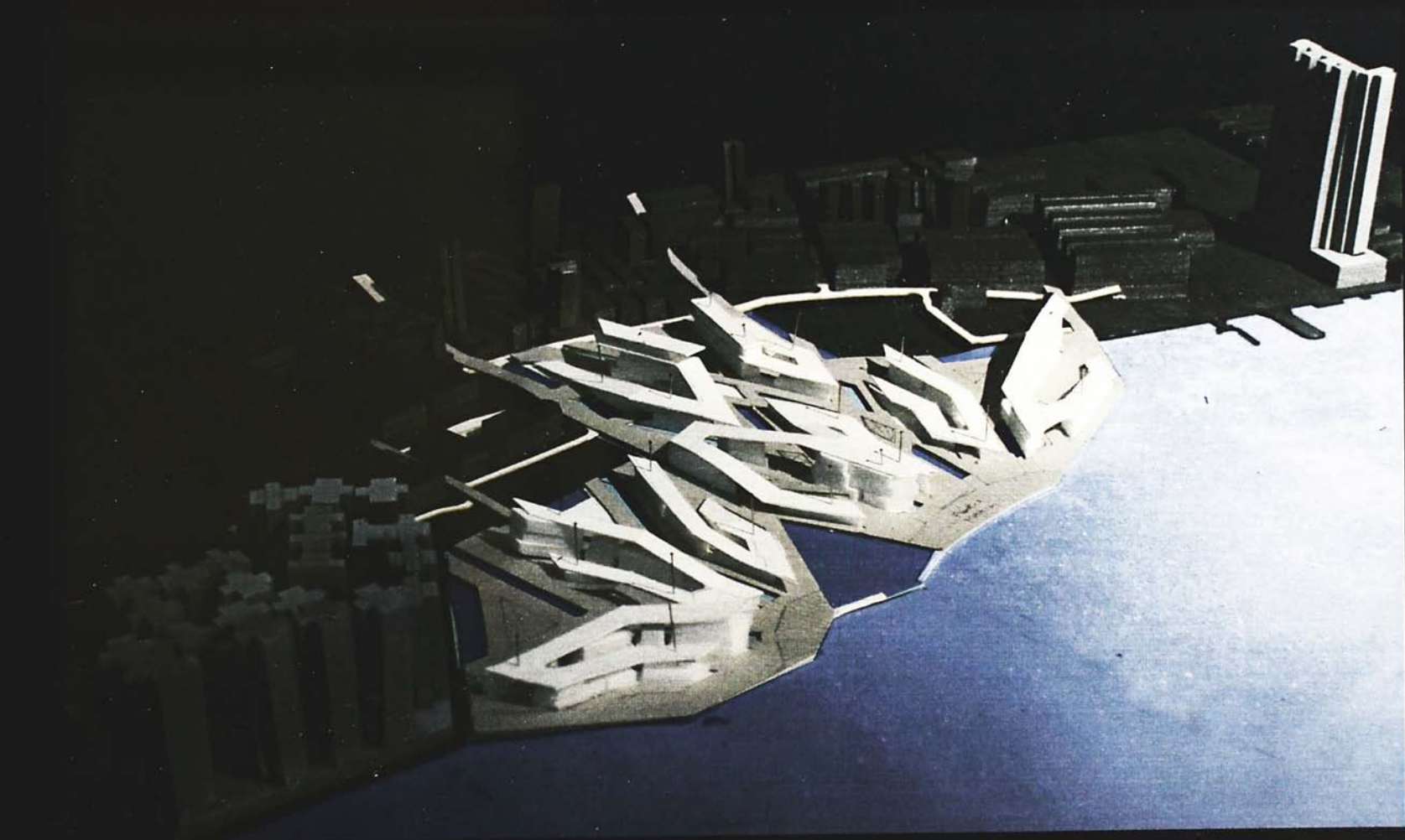




# Distorted Housing Form



## 10.5 Design Development - 1 : 2000 Conceptual Model





## 10.6 Design Development - 1 : 1000 Study Model





## 10.7 Design Development - 1 : 500 Fabric Model



## 10.8 Design Development - 1 : 200 Housing Model







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- 4 OCT 2011

30 OCT 2011

- 3 FEB 2011

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